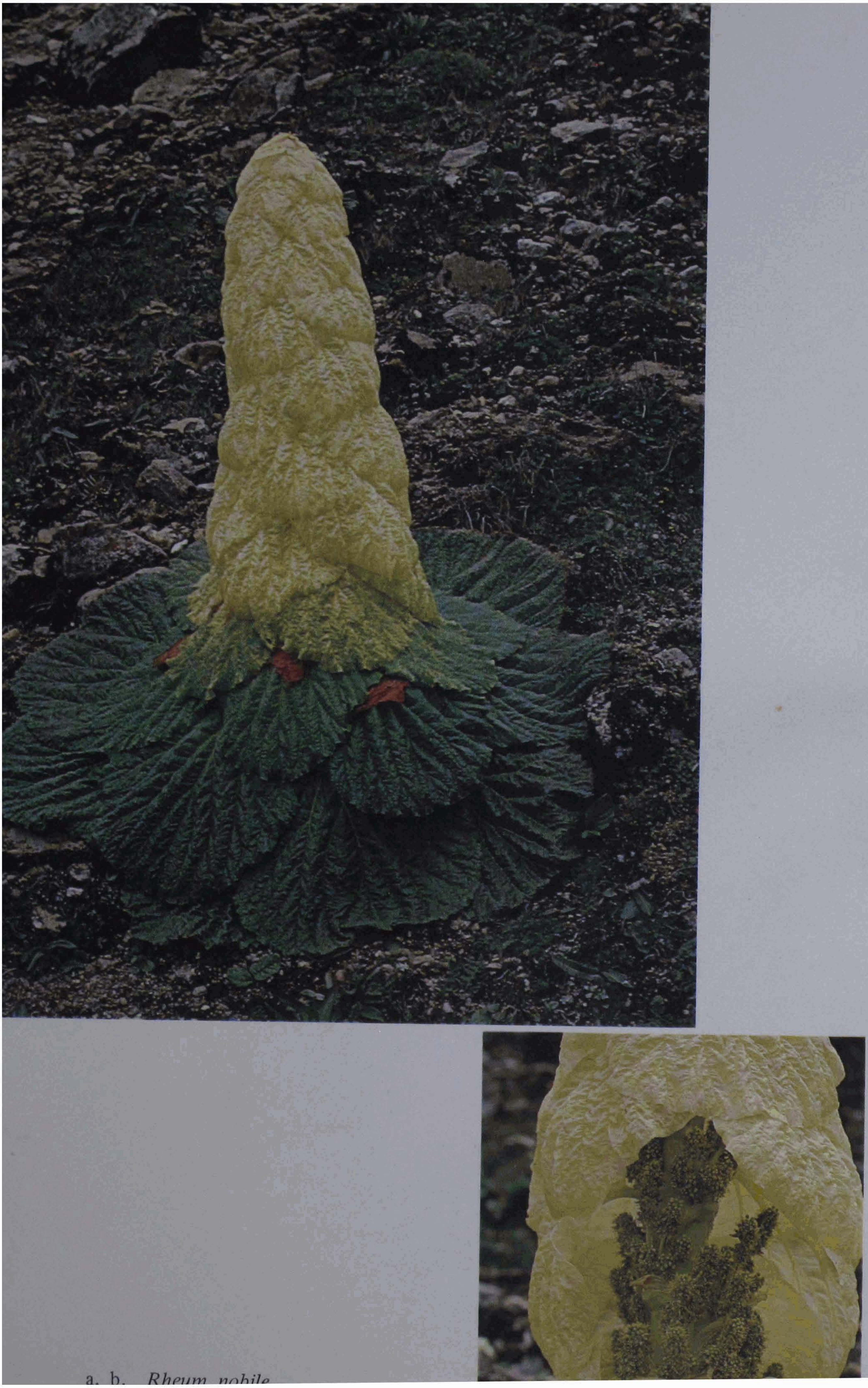

a, b. *Rheum nobile*

THE FLORA OF EASTERN HIMALAYA

THIRD REPORT

Results of the Botanical Expeditions to Eastern Himalaya in 197
Organized by the University of Tokyo

Compiled by
HIROYOSHI OHASHI

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THE FLORA OF EASTERN HIMALAYA
THIRD REPORT

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PREFACE

The present volume is the third report of "Flora of Eastern Himalaya" and is a continuation of the first two reports compiled by Prof. Hiroshi Hara, which were published on 31 December 1966 and 31 March 1971. This volume includes results of taxonomic studies mainly based on the collections by the Fifth Botanical Expedition to Eastern Himalaya in 1972 organized by the University of Tokyo and those by Dr. Hiroo Kanai during his stay in Nepal from 1969 to 1971 as a Colombo Plan Advisor to the Department of Medicinal Plants, H.M.G. of Nepal. It also contains data supplementary to the preceding two reports, which were published on the basis of our Expeditions in 1960, 1963 (two times), 1964, 1967, and 1969. The main purposes of the present research were stated in the first volume, and critical comparative studies on corresponding taxa in Japan and Himalaya have continued, though a number of results of our investigations were published elsewhere, as cited in the Systematic Enumeration or Bibliography in the former and present volumes.

We wish to express our sincere thanks to His Majesty's Government of Nepal and the Government of India for providing us with facilities during our trips. Thanks are especially due to Dr. P. R. Pande of the Ministry of Forests, H.M.G. of Nepal, and Dr. P. N. Suwal and Dr. S. B. Malla of the Department of Medicinal Plants, H.M.G. of Nepal, for their kindness in helping our Expedition in Nepal.

We are indebted to Dr. Hiroo Kanai, now the Curator of Phanerogam Herbarium in the National Science Museum, Tokyo, who was an Associate Professor of the University of Tokyo and the leader of the Fifth Botanical Expedition to Eastern Himalaya. Without his warm encouragement and leadership, the expedition could not have been carried out successfully.

Thanks are also due to Mr. Atsuhiko Aoyama of the University of Tokyo and Mr. Kunio Sato at Karuizawa who have helped us in cultivating the Himalayan plants for our study.

We are grateful for financial assistance from the Grant for Overseas Scientific Research in 1972 and the Grant-in-Aid for Fundamental Scientific Research in 1973 administered by the Ministry of Education of Japan.

October 1974

Hiroyoshi Ohashi

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CONTRIBUTORS

SPERMATOPHYTA	
Hara, Hiroshi	31-6, Kamimeguro-3, Meguro-ku, Tokyo.
Kanai, Hiroo	Division of Vascular Plants, Department of Botany, National Science Museum (Nat. Hist. Inst.), Tokyo.
Kimura, Arika	4-6, Tsunogoro-2, Sendai.
Kitamura, Siro	15, Tanaka-higashi-takahara-machi, Sakyo-ku, Kyoto.
Koyama, Tetsuo	New York Botanical Garden, New York, U.S.A.
Kurosawa, Sachiko	Department of Botany, Faculty of Science, University of Tokyo, Tokyo.
Momiyama, Yasuiti	12-6, Ôgigayatsu-1, Kamakura.
Murata, Gen	Department of Botany, Faculty of Science, Kyoto University, Kyoto.
Ohashi, Hiroyoshi	Department of Botany, Faculty of Science, University of Tokyo, Tokyo.
Ohba, Hideaki	Department of Botany, University Museum, University of Tokyo, Tokyo.
Ohwi, Jisaburo	4238-5, Take, Yokosuka.
Satake, Yoshisuke	25-29, Ryôke-7, Urawa.
Shakya, P. R.	Department of Medicinal Plants, H.M.G. of Nepal.
Shrestha, T. B.	Department of Medicinal Plants, H.M.G. of Nepal.
Tateishi, Yoichi	Department of Botany, Faculty of Science, University of Tokyo, Tokyo.
Tuyama, Takasi	Department of Biology, Faculty of Science, Ochanomizu University, Tokyo.
Yamazaki, Takasi	Botanical Gardens, Koishikawa, Faculty of Science, University of Tokyo, Tokyo.
PTERIDOPHYTA	
Iwatsuki, Kunio	Department of Botany, Faculty of Science, Kyoto University, Kyoto.
BRYOPHYTA	
Hattori, Sinske	Hattori Botanical Laboratory, Nichinan.
Iwatsuki, Zennoske	Hattori Botanical Laboratory, Nichinan.
Noguchi, Akira	Hattori Botanical Laboratory, Nichinan.

And their collaborators:

Amakawa, Tairoku (Shuyukan High School), Ando, Hisatsugu (Hiroshima University), Grolle, Riclef (Institut für Spezielle Botanik), Inoue, Hiroshi (National Science Museum), Kitagawa, Naofumi (Nara University of Education), Mizushima, Urara (Fuchû), Mizutani, Masami (Hattori Botanical Laboratory), Ochi, Harumi (Tottori University), Saito, Kamezo (Tokyo Kyoiku University), Seki, Taro (Hiroshima University), Smith, Gary L. (New York Botanical Garden), Steere, William C. (New York Botanical Garden), Suzuki, Hyoji (Hiroshima University), Takaki, Noriwo (Nagoya University), and Yamada, Kohsaku (Ujiyamada High School).

EXPLANATION OF PLATES

Plate 1. a. *Rheum nobile* Hook. f. et Thoms.
Thudam—Kipuphu, 4200 m (Jun. 26, 1972). ×1/10.
b. A part of the inflorescence showing male panicle, bracts in front removed. ×1/4.

Plate 2. a. *Bistorta amplexicaulis* (D. Don) Greene var. *pendula* Hara.
Gopte—Thale Patil, 3500–3200 m (Aug. 26, 1972). ×1/4.
b. *Clematis alternata* Kitamura et Tamura.
Khirojet—Yatumbal, 2600 m (Jun. 29, 1970). ×6/5.
c. *Salix anticecrenata* Kimura mstr. *monadelpha* Kimura.
Banduke Pokhari—Saju Pokhari, 4200–4000 m (Jun. 15, 1972). ×1.

Plate 3. a. *Meconopsis horridula* Hook. f. et Thoms.
Jalang Chhyongo—Thudam, 4400 m (Jun. 21, 1972). ×1/2.
b. *Meconopsis discigera* Prain.
Samdan, 4400 m (Jun. 24, 1972). ×1/4.
c. *Sedum bupleuroides* Wall. ex Hook. f. et Thoms.
Gosainkund—Gopte, 4200–3500 m (Aug. 25, 1972). ×1/4.
d. *Sedum linearifolium* Royle.
Thale Patil—Hile Dhap, 3400 m (Aug. 27, 1972). ×6/5.

Plate 4. a. *Gueldenstaedtia himalaica* Baker.
Topke Gola, 3600 m (Jun. 17, 1972). ×1.
b. *Hedysarum sikkimense* Benth. ex Baker.
Lama Chungbu—Thudam, 4000 m (Jun. 24, 1972). ×1.
c. *Geranium Lambertii* Sweet.
Singum Gompa, 3200 m (Aug. 22, 1972). ×2/5.
d. *Geranium procurrens* P. F. Yeo.
Mangen—Khodang Danda, 3100–2500 m (Aug. 28, 1972). ×1.
e. *Geranium refractum* Edgew. et Hook. f.
Thudam—Kipuphu, 3400–4500 m (Jun. 26, 1972). ×1.

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Ghum, 2300 m (Jul. 7, 1969). ×1/2.
b. A leaf with fruits of the same species.
Palmajua—Batasi, 2200–2100 m (Aug. 8, 1972). ×ca. 1.
c. *Helwingia japonica* (Thunb.) Dietr. var. *japonica*.
Usui Pass, Karuizawa, Japan (Aug. 27, 1971). ×1/2.
d. *Begonia dioica* Hamilt. ex D. Don, ♀.
Palmajua, 2200 m (Aug. 6, 1972). ×1/3.
e. *Passiflora napalensis* Wall.
Dhara Pani—Sanguri Bhanjyang, 1200 m (Jul. 10, 1972). ×6/5.

Plate 6. a. *Lysionotus atropurpureus* Hara.
Siri Khola—Rimbick, 2100–2200 m (Aug. 5, 1972). ×2/3.
b. *Chirita calva* C. B. Clarke.
Raman—Rimbick, 1900–2400 m (Aug. 5, 1972). ×3/4.

c. *Platystemma violoides* Wall.
Trisuli Khola, 2000 m (Aug. 22, 1972). ×4/5.
d. *Cotylanthera paucisquama* C. B. Clarke.
Palmajua, 2200 m (Aug. 7, 1972). ×1/3.
e. The same at the natural habitat. ×2/3.

Plate 7. a, b. *Diplomeris hirsuta* Lindl.
Sim Chotala, 900 m (Aug. 20, 1972). a×3/5, b×1.
c. *Cypripedium elegans* Reichb. f.
Topke Gola, 3600 m (Jun. 17, 1972). ×1.
d. *Gastrodia Dyeriana* King et Pantl.
Palmajua, 2200 m (Aug. 7, 1972). ×4/5.
e. *Calanthe trulliformis* King et Pantl.
Below Raman, 2400 m (Aug. 4, 1972). ×4/5.
f. *Anoectochilus lanceolatus* Lindl.
Simkuna, 2200 m (Aug. 10, 1972). ×6/5.

Plate 8. a. Holotype of *Salix anticecrenata* Kimura, ♀.
Topke Gola, 3800 m (Kanai, Ohashi, K. Iwatsuki, Ohba, Z. Iwatsuki & Shakya TI 727278).
b. A part of the holotype. ×2.7.

Plate 9. Micrographs of various small portions of orchid flowers from E. Himalaya. Photo by Miss Keiko Nishikawa, all from the moistened specimen.
a. *Anoectochilus lanceolatus*. Simkuna (Aug. 10, 1972). One of the coupled callose plates inside the spur. ×ca. 30.
b. *Habenaria latilabris*. Chauke—Dor (Jul. 6, 1972–much hairy individual). Upper portion of the lateral sepal. ×ca. 100.
c. The same. Portion of the middle part of the same sepal. ×ca. 100.
d. The same. The middle portion of the sepal. Dunche—Singum Gompa (Aug. 22, 1972–less hairy individual). ×ca. 100.
e. *Habenaria goodyeroides*. Sim Chotala—Gram (Aug. 20, 1972). Portion of the lip including the right-hand sinus. ×ca. 100.
f. *Listera pinetorum*. Lamo Pokhari (Jun. 9, 1972). Upper portion of the margin of the lip. ×ca. 200.
g. The same lip at the middle portion. ×ca. 200.
h. The same lip at the lower portion. ×ca. 200.

Plate 10. a. Holotype of *Sedum callianthum* H. Ohba (Stainton 4703 BM).
b. Holotype of *Sedum nepalicum* H. Ohba (Stainton, Sykes & Williams 2222 BM).
c. *Sedum discolor* Franch. (Kanai, Hara & Ohba TI 726336).
d. *Sedum Prainii* R.-Hamet (Polunin, Sykes & Williams 3800 TI).

Plate 11. *Sedum crenulatum* Hook. f. et Thoms.
a. Yeumtong, Sikkim (J. D. Hooker in 1849 K–lectotype of *S. crenulatum* Hook. f. et Thoms.).
b. Monte Yülingshan, prope Likiang, Yunnan (Handel-Mazzetti 3822 GB–isotype of *S. euryphyllum* Fröd.).
c. Inukhu Khola, Naulekh Mathi, Nepal (Mc Cosh 376 BM).
d. Gooring Valley, Tibet (Littledale in 1895 K–holotype of *S. rotundatum* Hemsley).

Plate 12. Himalayan *Hedysarum* (1).
a. Lectotype of *H. astragaloides* Benth. ex Baker (Thomson in 1848 K).

- b. Isotype of *H. campylocarpon* Ohashi (Polunin 1226 TI).
- c. Lectotype of *H. microcalyx* Baker (Falconer 439 K).
- d, d′. *H. cachemirianum* Benth. ex Baker (d: Polunin 56/566 BM, d′: Rao 9552 TI).

Plate 13. Himalayan *Hedysarum* (2).

- e. Lectotype of *H. Falconeri* Baker (Falconer 441 K).
- f. *H. kumaonense* Benth. ex Baker (Stainton, Sykes & Williams 856 TI).
- g. Lectotype of *H. laxiflorum* Benth. ex Baker (=*H. alpinum* L. subsp. *laxiflorum* (Benth. ex Baker) Ohashi et Tateishi) (Falconer 440 K).
- h. Isotype of *H. nepalense* Ohashi var. *subhirtellum* Ohashi (=*H. manaslense* (Kitamura) Ohashi) (Lowndes 1474 TI).

Plate 14. Himalayan *Hedysarum* (3).

- i. Holotype of *H. pseudomicrocalyx* Ohashi et Tateishi (Duthie 21252 K).

Plate 15. Himalayan *Hedysarum* (4).

- j. *H. sikkimense* Benth. ex Baker var. *sikkimense* (Kanai et al. TI 720706).
- k. Holotype of *H. sikkimense* Benth. ex Baker var. *megalanthum* Ohashi et Tateishi (Ludlow, Sherriff & Elliot 13160 BM)

Plate 16. *Helwingia japonica* (Thunb.) Dietr. var. *japonica* from Jinmuji, Japan.

- a. Leaves with male flowers. ×ca. 1.
- b. Leaf-margin. ×3.
- c. Male flowers. ×3.
- d. A female flower. ×3.
- e. Pollen grain. ×700.
- f. Stoma. ×80.

Plate 17. *Helwingia japonica* (Thunb.) Dietr.

- a. Anhwei: Chiu Hwa Shan (Fan & Li 94 E).
- b. Yunnan: Chienchuan—Mekong Divide (Forrest 21942 E).

Plate 18.

- a, b. *Helwingia japonica* var. *nanchuanensis* Fang.
  Szechuan: Nanchuan Hsien (Hwang 91 A–isotype).
- c, d. *H. japonica* var. *hypoleuca* Hemsl. ex Rehder.
  Hupeh: Patung (Henry 1706 A–type).
- d. Stomata and papillae. ×80.

Plate 19.

- a. *Helwingia japonica* var. *parvifolia* Makino.
  Japan. Prov. Kai: Shimobe (Hisauchi TI).
- b. *H. japonica* subsp. *liukiuensis* (Hatusima) Hara et Kurosawa.
  Okinawa: Hentona—Yonahadake (Y. Kimura & Hurusawa TI).
- c. *H. japonica* subsp. *formosana* (Kaneh. et Sasaki) Hara et Kurosawa.
  Formosa: Tawushan (Namba et al. 382 TI).

Plate 20. *Helwingia himalaica* Hook. f. et Thoms.

- a. Sikkim (Hook. f. K–type).
- b. Tonkin: Chapa (Pételot 5679 A).
- c. A flowering branch. Darjeeling: Ghum (Apr. 29, 1970). ×3/5.
- d. Stomata. Darjeeling: Ghum (Apr. 29, 1970), cultivated at Karuizawa. ×80.

Plate 21.

- a. *Helwingia himalaica* var. *parvifolia* Li.
  Yunnan: Londjire (Rock 8871 A–type).
- b. *H. chinensis* f. *megaphylla* Fang.
  Kiangsi: Hong Shan (Gressitt 1514 A–isotype).

Plate 22. *Helwingia chinensis* Batalin.
Hupeh: S. Patung (Henry 6719B, ♂ fl. K). b, c. × 1.

Plate 23. *Helwingia chinensis* Batalin.
- a. Szechuan (Henry 6719A CAL–isosyntype of *H. chinensis*).
- a′. A leaf of the same. × 1.
- b. N. Burma: Ngawchang Valley (K.-Ward 63 A–type of *H. himalaica* var. *stenophylla*).

Plate 24. *Helwingia chinensis* Batalin.
- a. Hupeh: Hsing-shan Hsien (E. H. Wilson 172 E).
- b. Hupeh: Patung (Chow 133 E).

Plate 25. *Helwingia chinensis* var. *crenata* (Lingelsh.) Fang.
- a. Szechuan: Kwan Hsien (Limpricht 1286A A–photo of type).
- b. Szechuan: Kuan Hsien (S. S. Chien 5682 BM).

Plate 26. *Helwingia chinensis* Batalin.
- a. A leaf of f. *megaphylla* Fang. Kiangsi: Hong Shan (Gressitt 1514 E–isotype). × 1.
- b. Leaves of f. *chinensis*. N. Burma: Maikha—Salwin Divide (Forrest 29726 E). × 1.

Plate 27. *Helwingia omeiensis* (Fang) Hara et Kurosawa.
- a. Szechuan: Mt. Omei (Fang 12621 A–isotype).
- b. The same locality (Chiao & Fang 405 A).

Plate 28. *Helwingia omeiensis* var. *oblanceolata* (Chien) Hara et Kurosawa.
- a. Kweichow: Tungtze (Tsiang 4966 E–isotype).
- b. Kweichow: Liang Fang Yah (Steward, Chao & Cheo 23 BM).

Plate 29. Leaves of *Helwingia omeiensis* (a, b) and its var. *oblanceolata* (c–e). × 1.
- a. Szechuan: Mt. Omei (Fang 12621 A–isotype).
- b. The same locality (E. H. Wilson 4942 BM).
- c. Kweichow: Tungtze (Tsiang 4966 E–isotype).
- d. Yunnan: Lunguan (Yü 20017 E).
- e. Kweichow: Tungtze (Tsiang 4966 K–isotype).

Plate 30. Scanning electron micrographs of the undersurface of leaf.
- a. *Helwingia japonica*. × 710.
- b. The same. × 2100.
- c. *H. japonica* subsp. *liukiuensis*. × 710.
- d. *H. himalaica*. × 710.
- e. The same. × 2100.

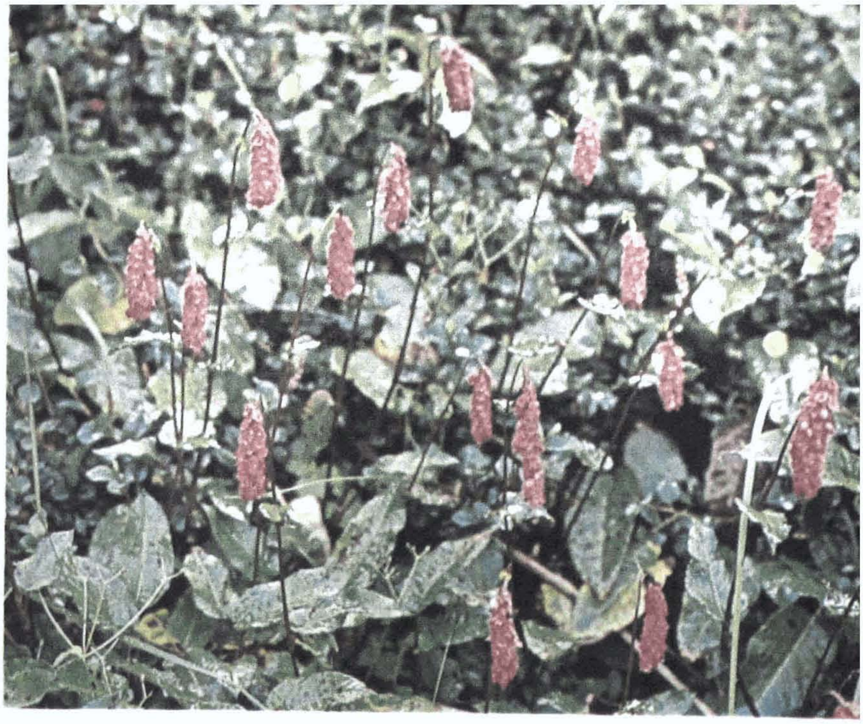
Plate 31. Scanning electron micrographs of the undersurface of leaf.
- a. *Helwingia japonica* var. *hypoleuca* Hemsl. ex Rehd. (E. H. Wilson 132, cult. at Roy. Bot. Gard., Edinburgh). × 710.
- b. The same. × 2100.
- c. *H. japonica* var. *nanchuanensis* Fang (Hwang 91 A–isotype). × 710.
- d. The same. × 2100.

Plate 32. Scanning electron micrographs of the undersurface of leaf.
Helwingia omeiensis (Fang) Hara et Kurosawa from Mt. Omei.
a, b. (Chow 9934 A), c, d. (Chow 11683 A).
a, c. × 710. b, d. × 2100.

Plate 33. Micrographs of somatic chromosomes of *Helwingia*. × 1900.
- a. *H. himalaica* from Ghum, Darjeeling.

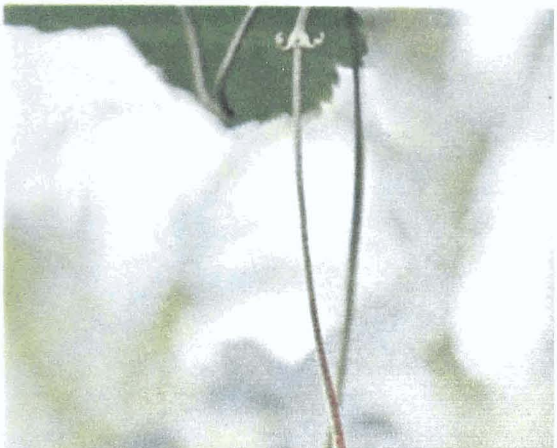
b. *H. japonica* var. *hypoleuca* from Roy. Bot. Gard., Edinburgh.
c. *H. japonica* var. *parvifolia* from Kawazu, Prov. Izu.
d. The same from Mt. Kanmuri, Prov. Satsuma.
e. *H. japonica* subsp. *formosana* from Nankotaisan, Formosa.
f. *H. japonica* subsp. *liukiuensis* from Mt. Katsuudake, Ryukyu.
g. *H. japonica* var. *parvifolia* from Mt. Tara, Prov. Hizen.

Plate 2

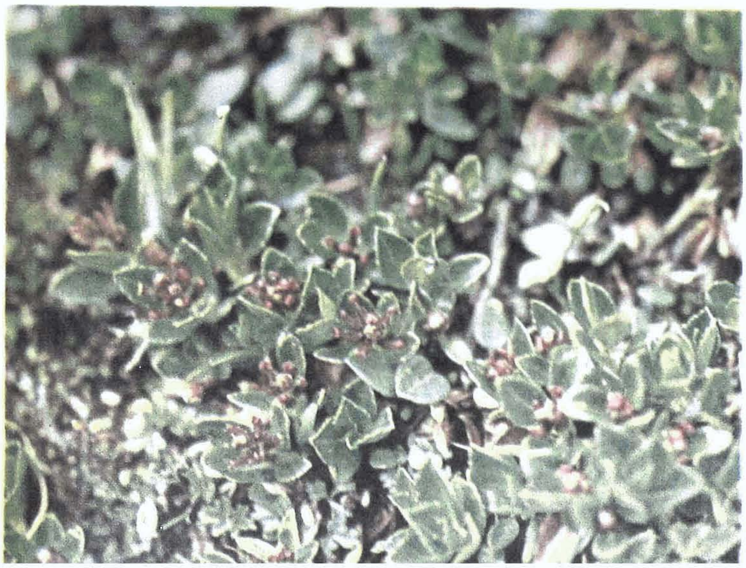


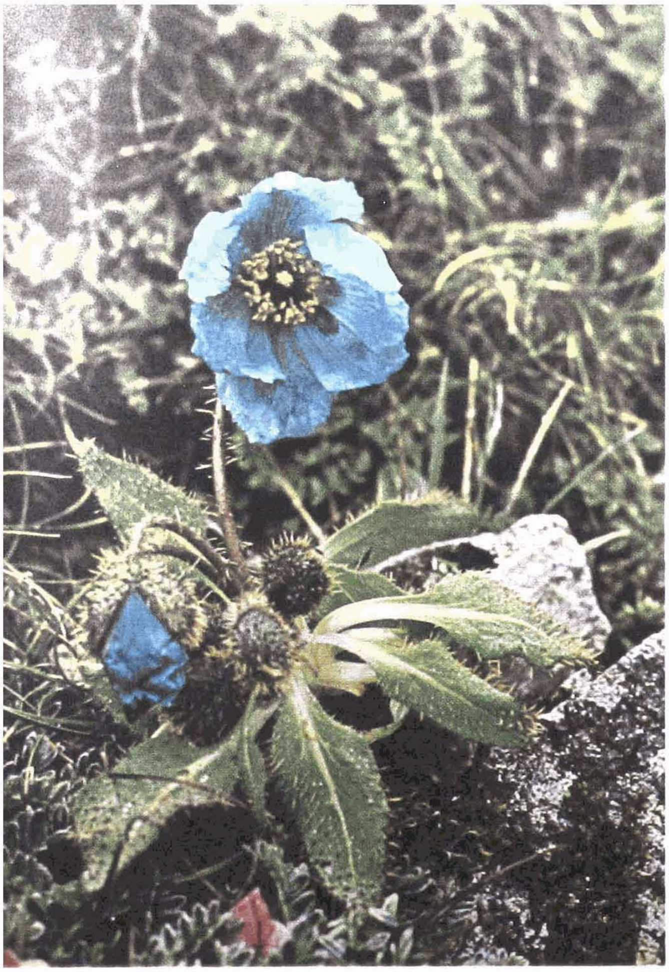
a. *Bistorta amplexicaulis* var. *pendula*

b. *Clematis alternata*

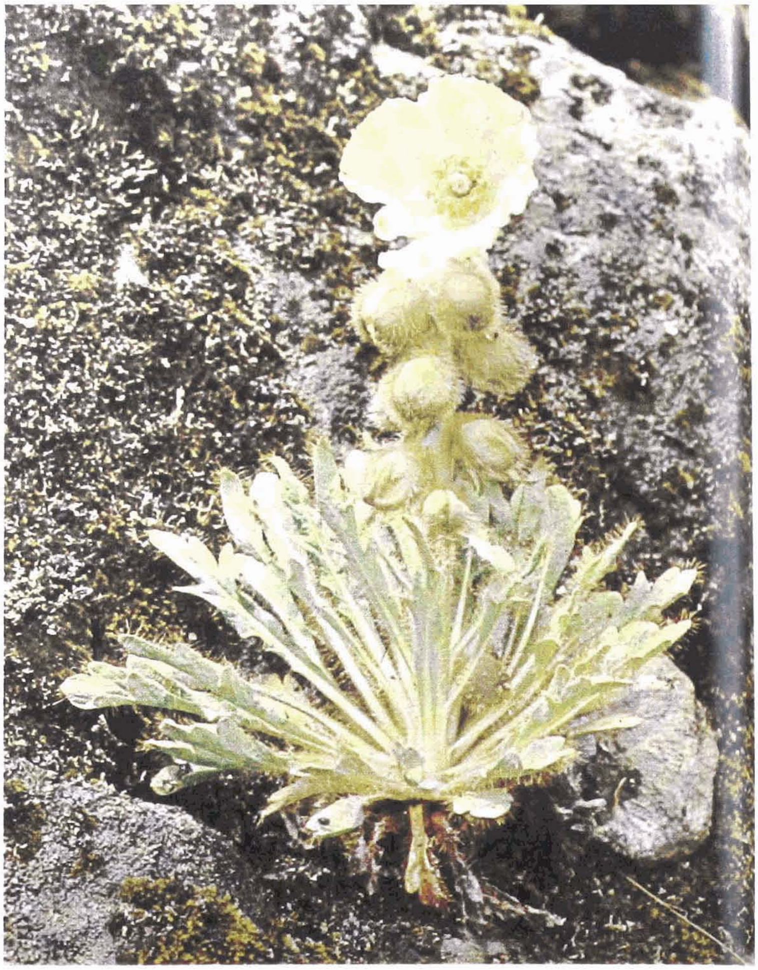


c. *Salix anticecrenata* mstr. *monadelpha*





a. *Meconopsis horridula*



b. *Meconopsis discigera*

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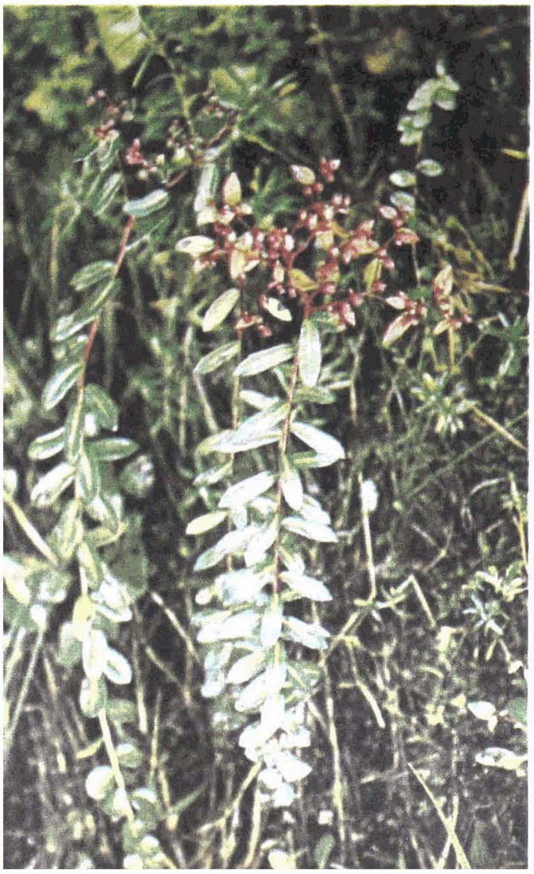
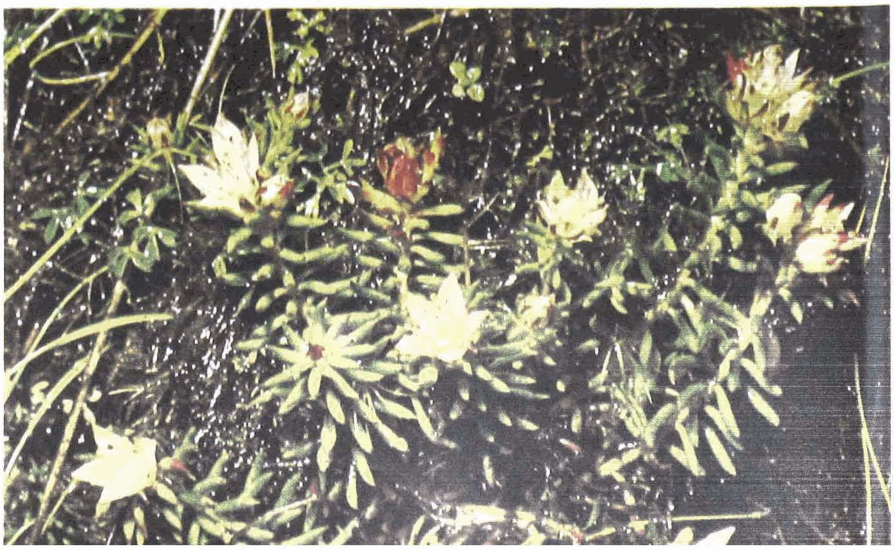
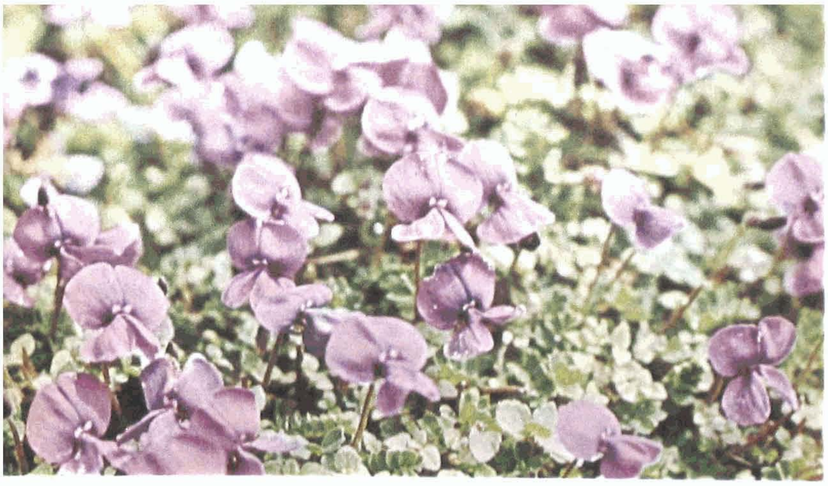


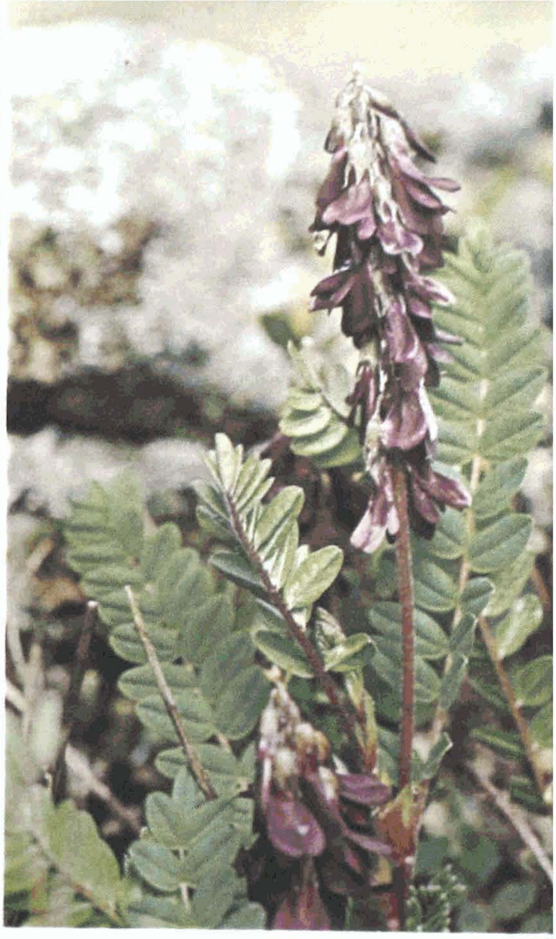
c. *Sedum bupleuroides*

d. *Sedum linearifolium*

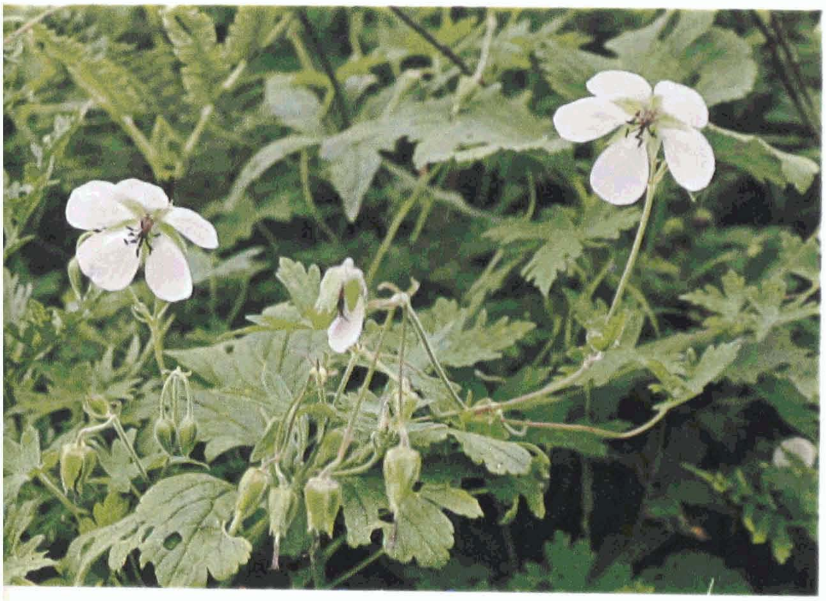




a. *Gueldenstaedtia himalaica*

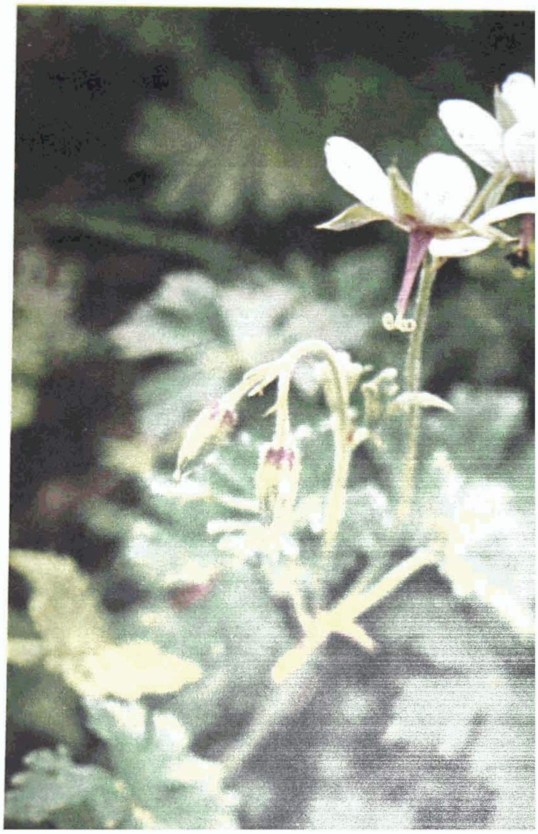


b. *Hedysarum sikkimense*

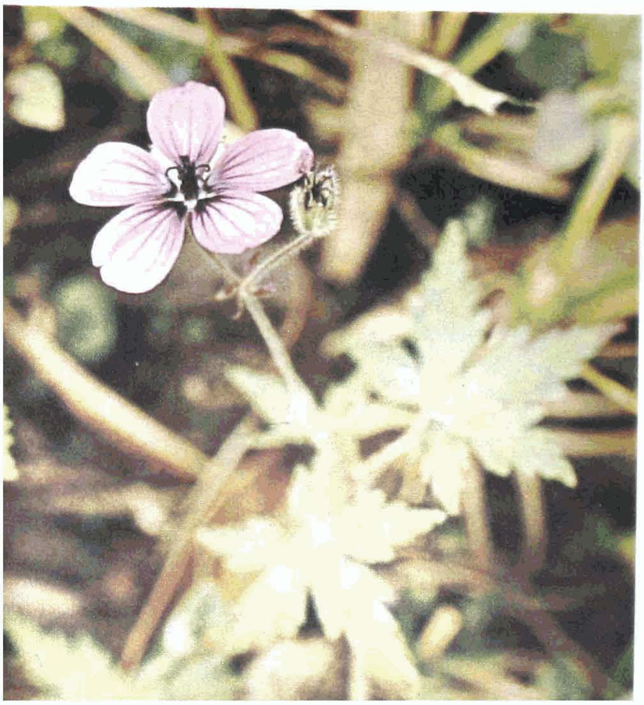


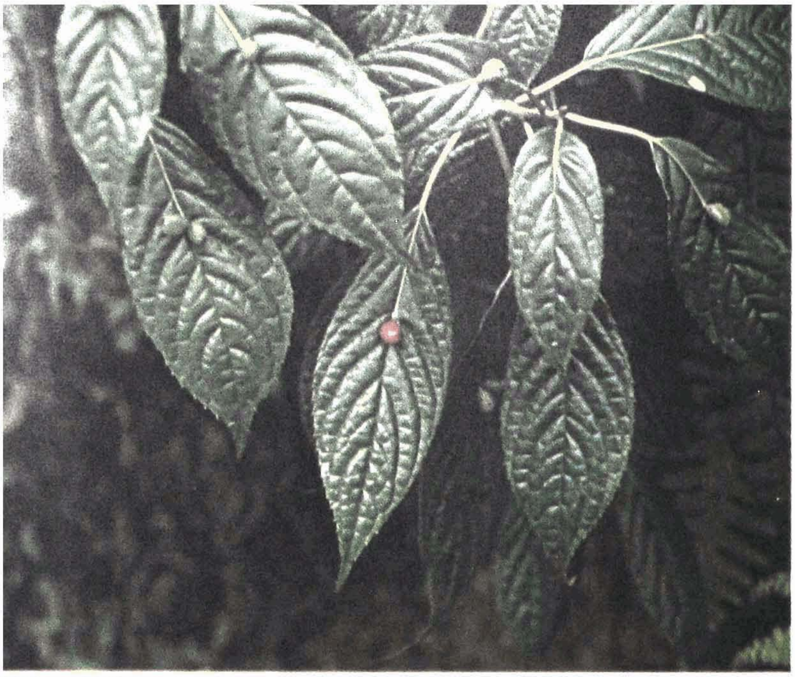
c. *Geranium Lambertii*

c. *Geranium refractum*

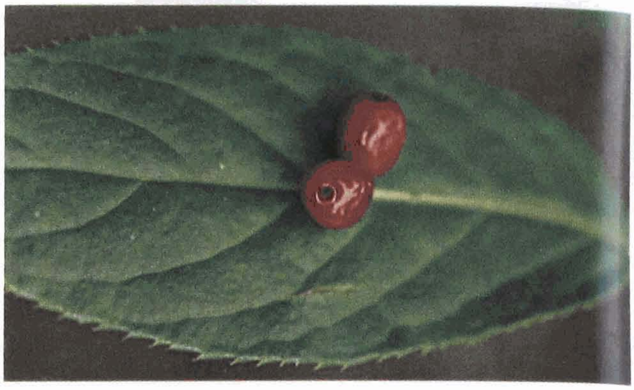


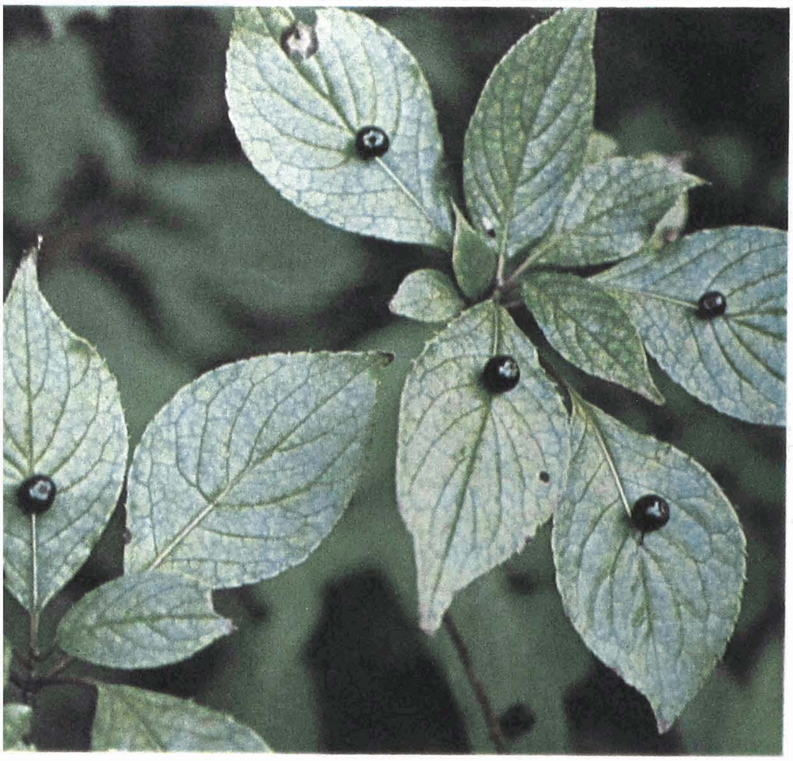
d. *Geranium procurrens*





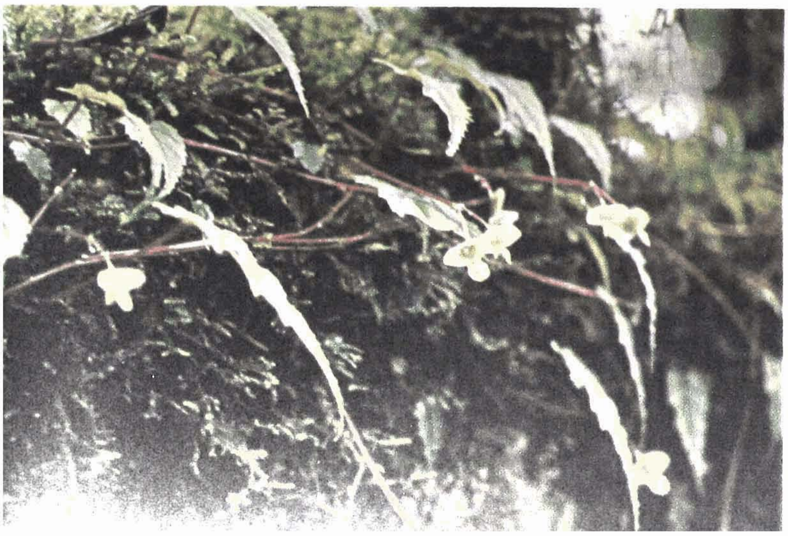
a, b. *Helwingia himalaica*



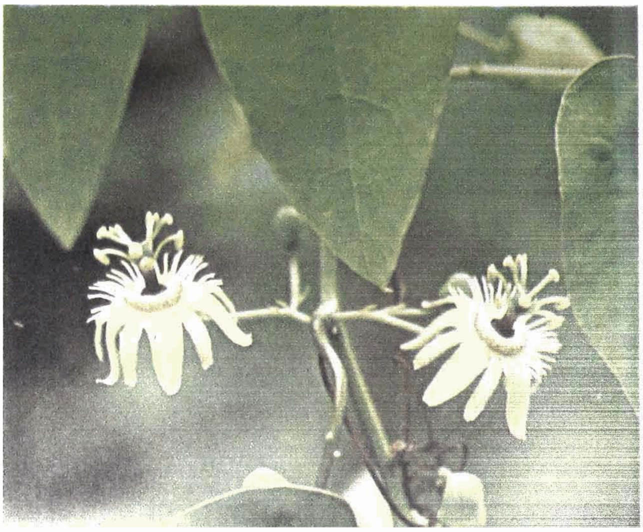


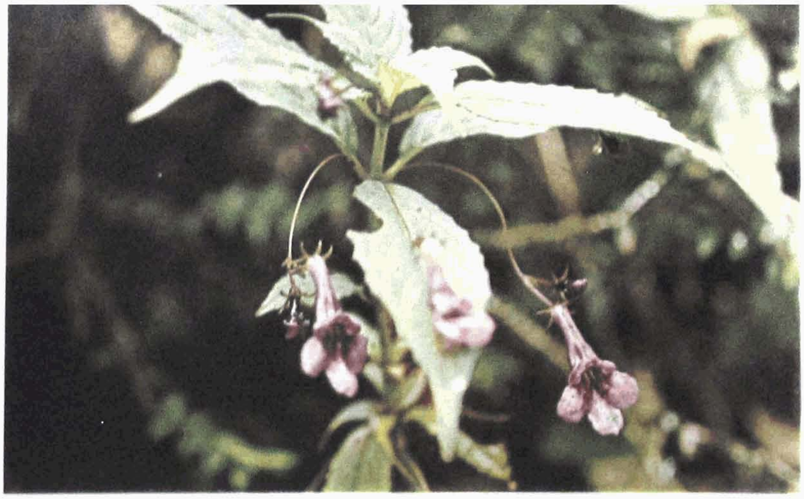
c. *Helwingia japonica*

d. *Begonia dioica*

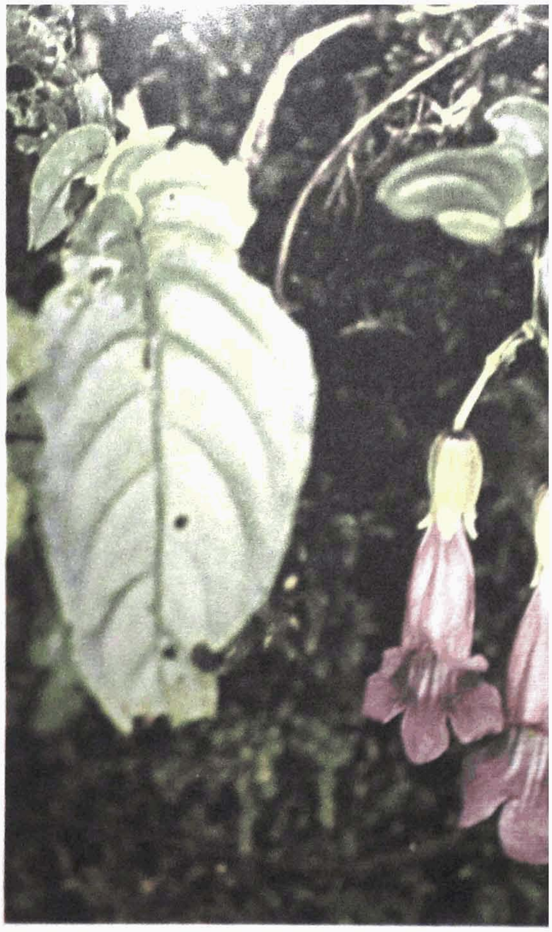


e. *Passiflora nepalensis*





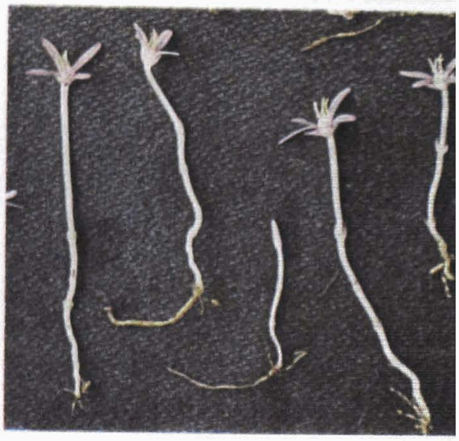
a. *Lysionotus atropurpureus*



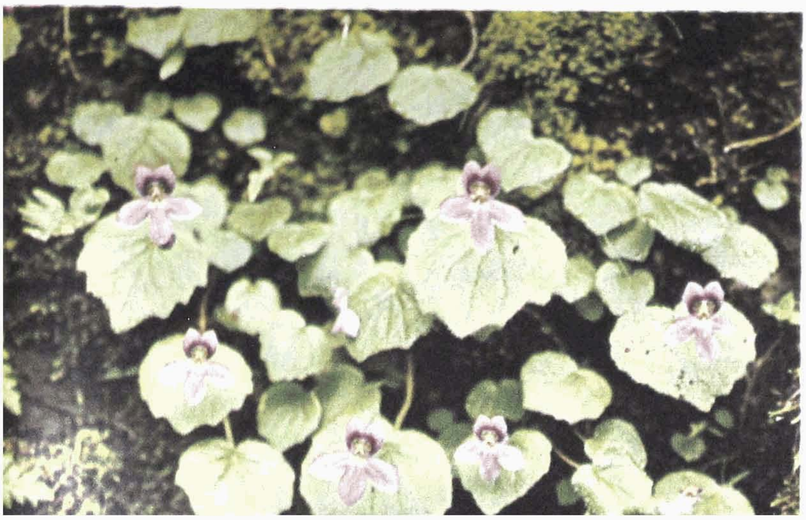
b. *Chirita calva*

Plate 6

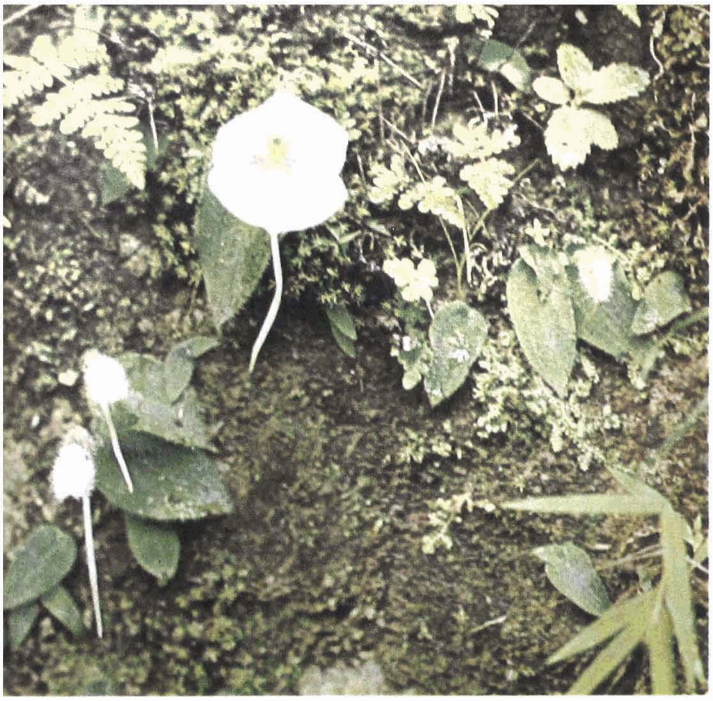
d, e. *Cotylanthera paucisquama*



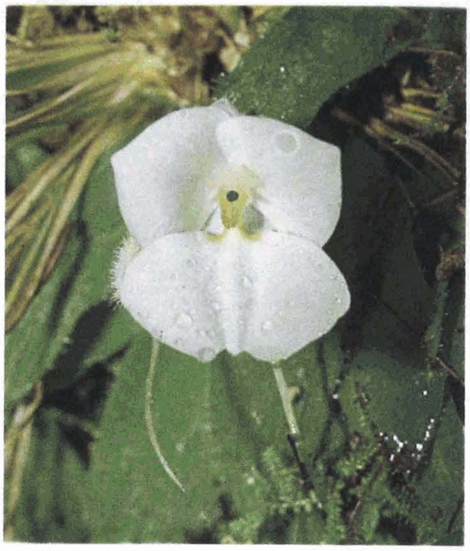
c. *Platystemma violoides*



e

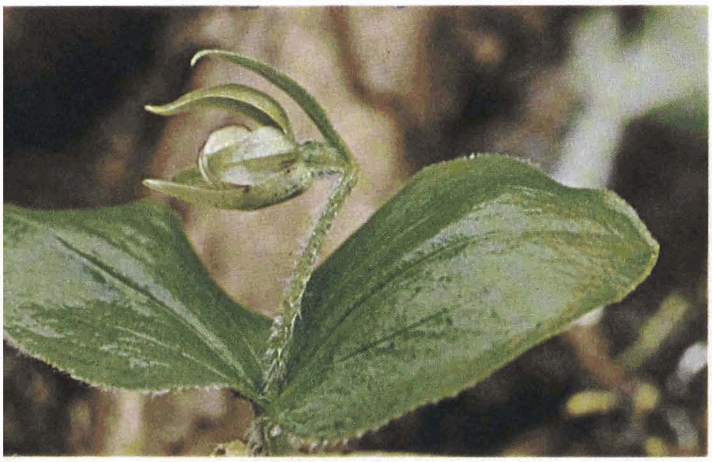


a



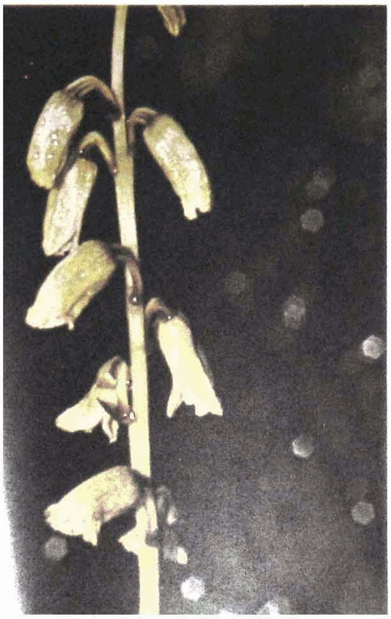
b

a, b. *Diplomeris hirsuta*

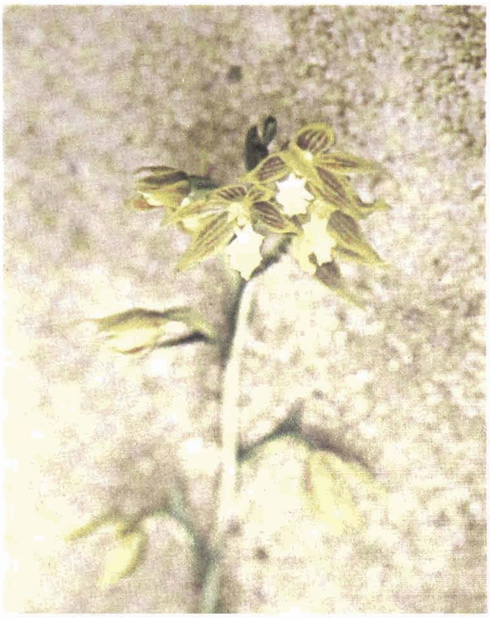


Cypripedium elegans

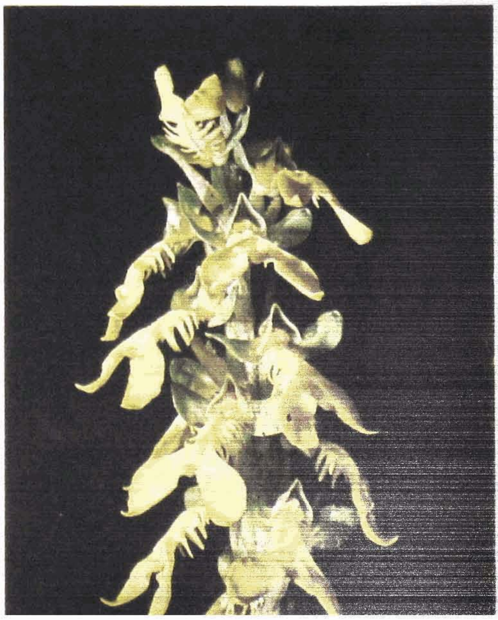
Gastrodia Dyeriana

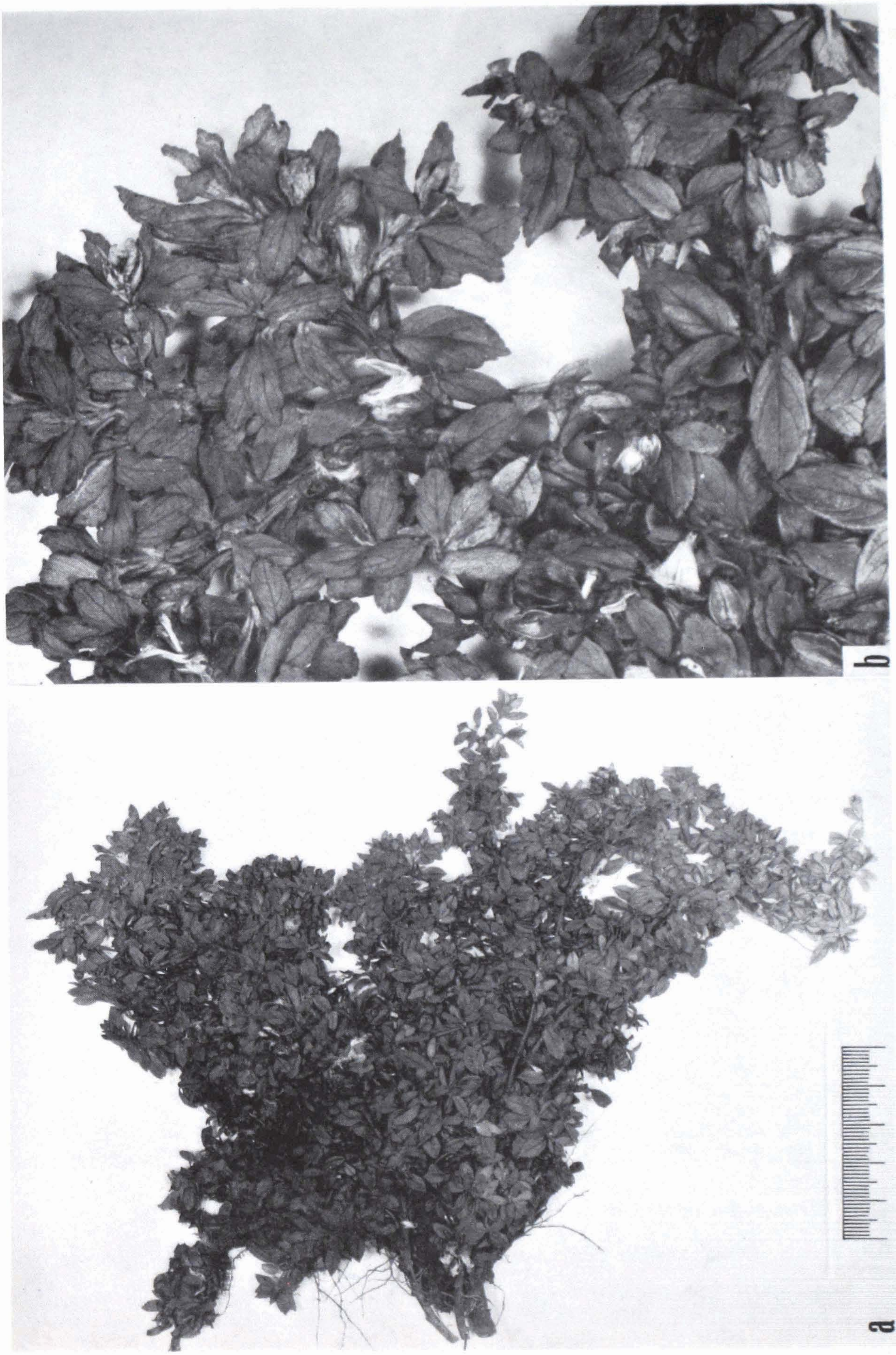


e. *Calanthe trulliformis*

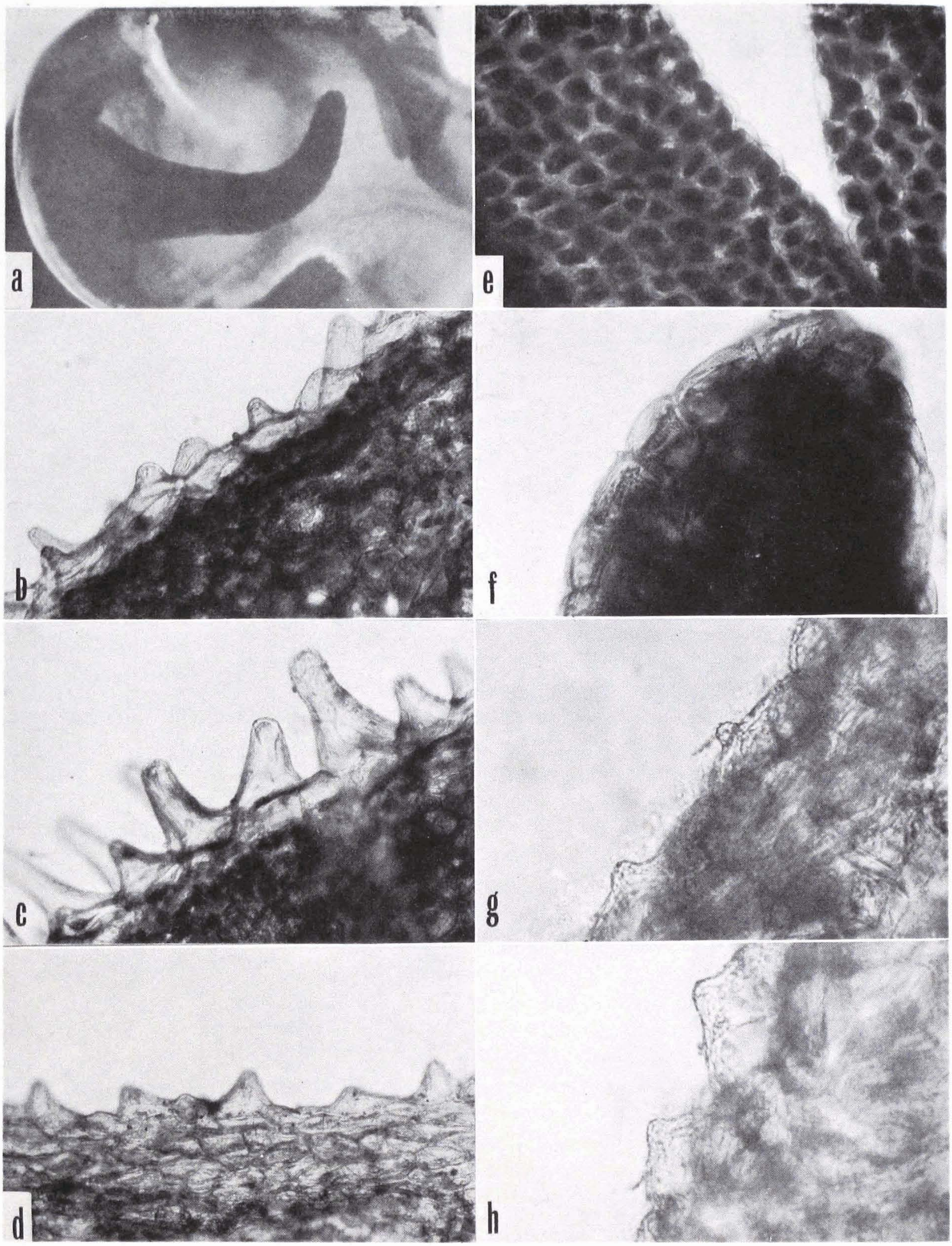


f. *Anoectochilus lanceolatus*





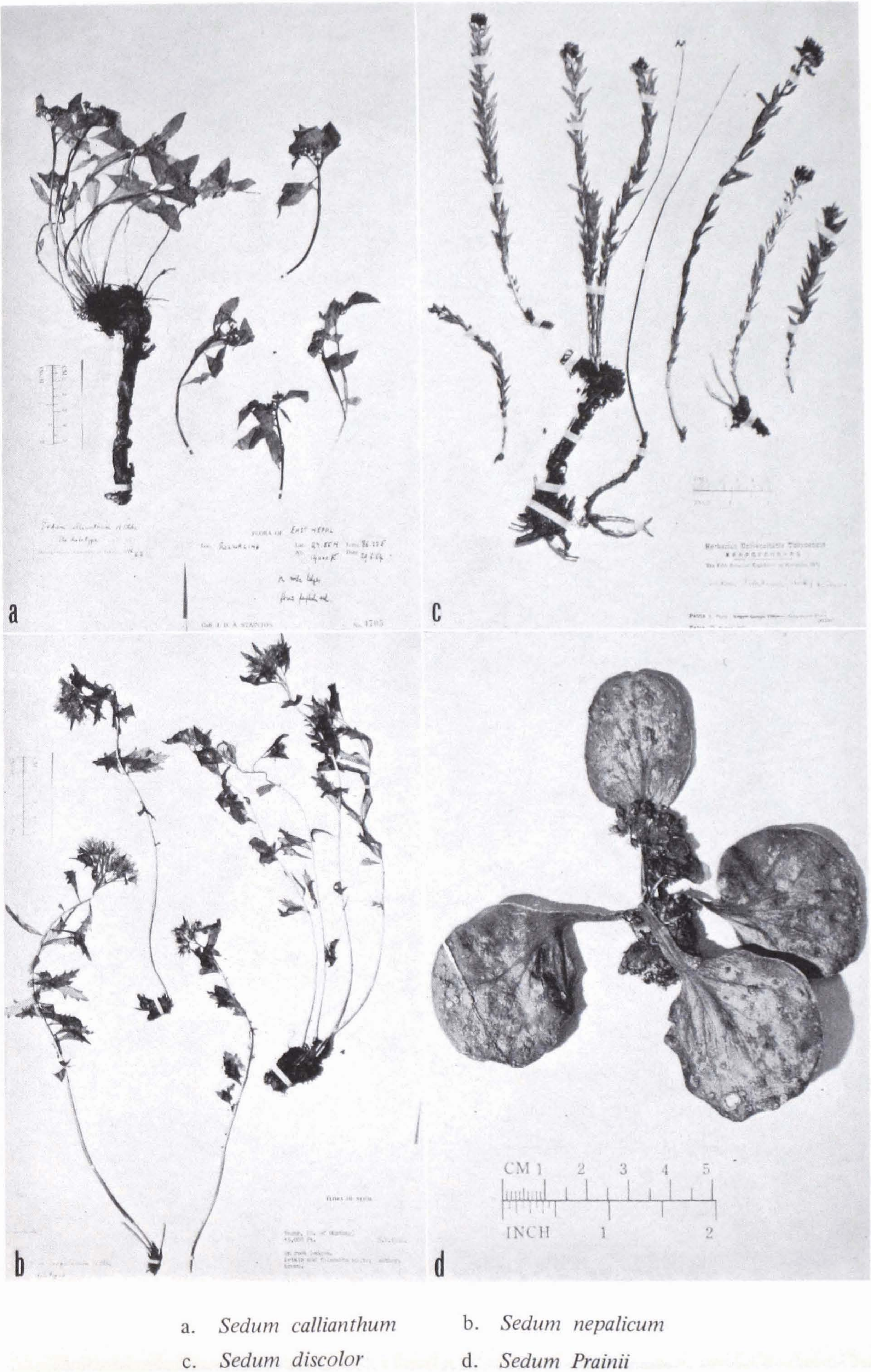
a, b. *Salix anticecrenata* ♀



Micrographs of various small portions of orchid flowers from E. Himalaya

a. *Anoectochilus lanceolatus* b – d. *Habenaria latilabris*

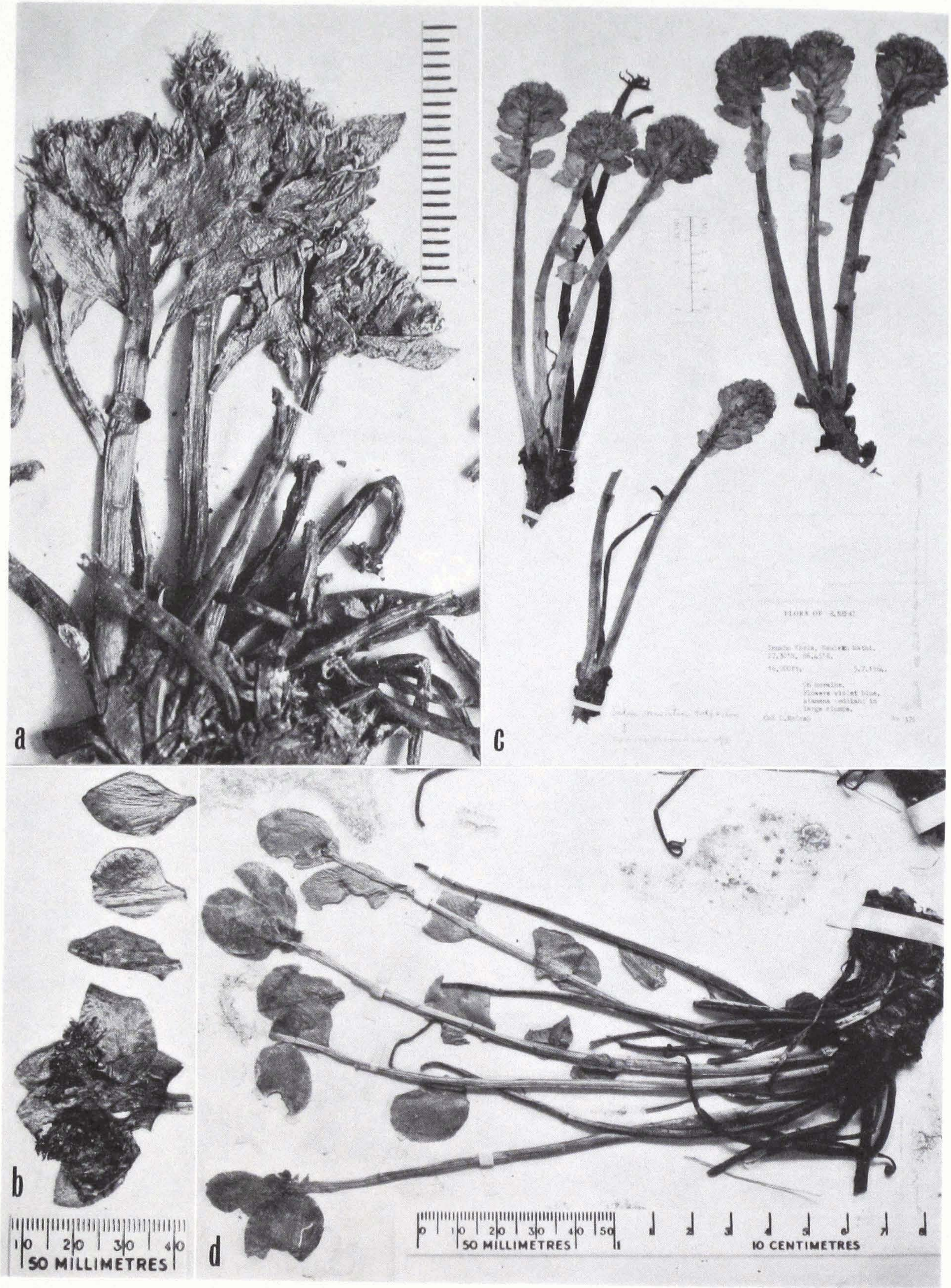
e. *Habenaria goodyeroides* f – h. *Listera pinetorum*



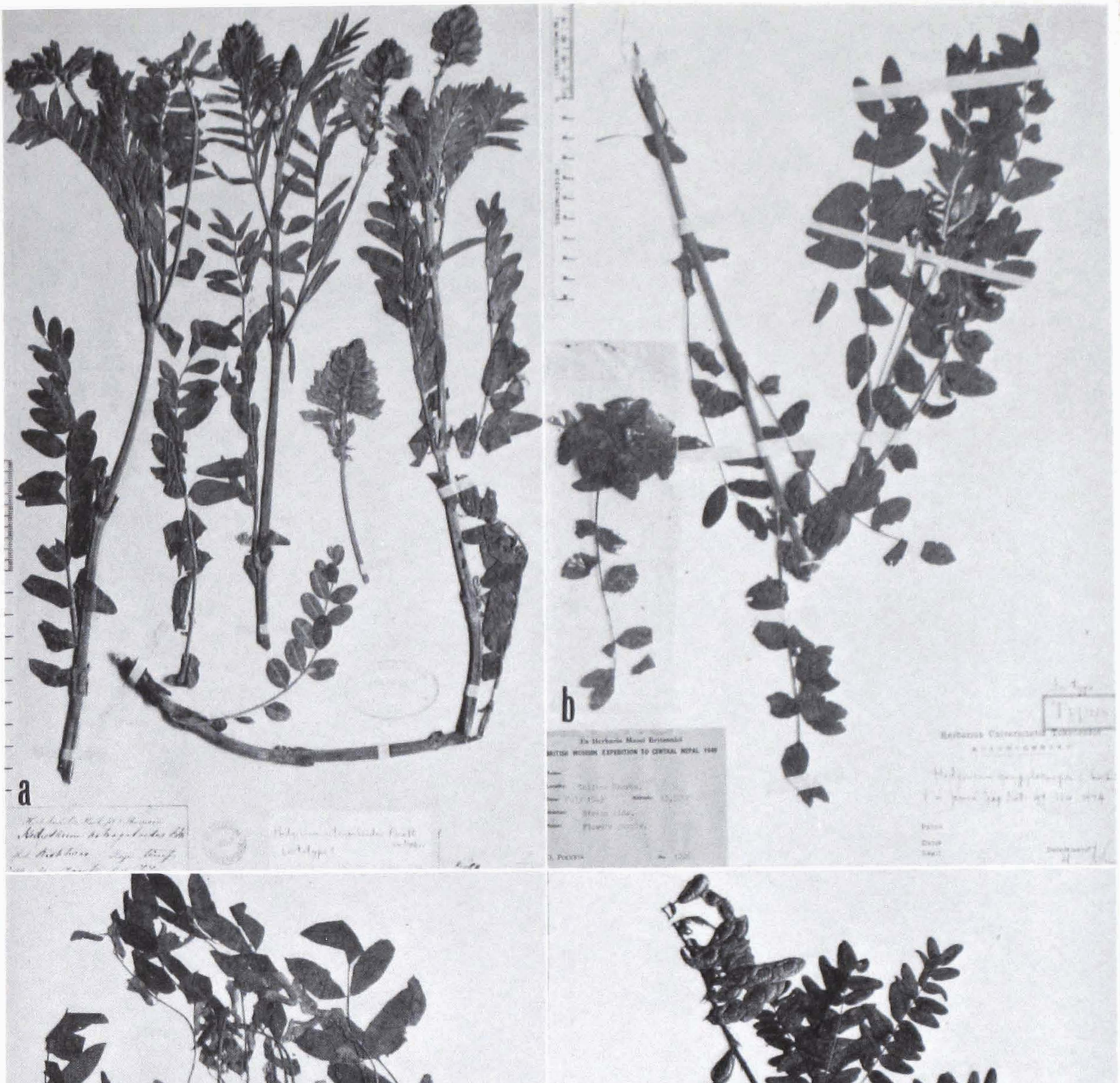
a. *Sedum callianthum* b. *Sedum nepalicum*

c. *Sedum discolor* d. *Sedum Prainii*

Plate 11



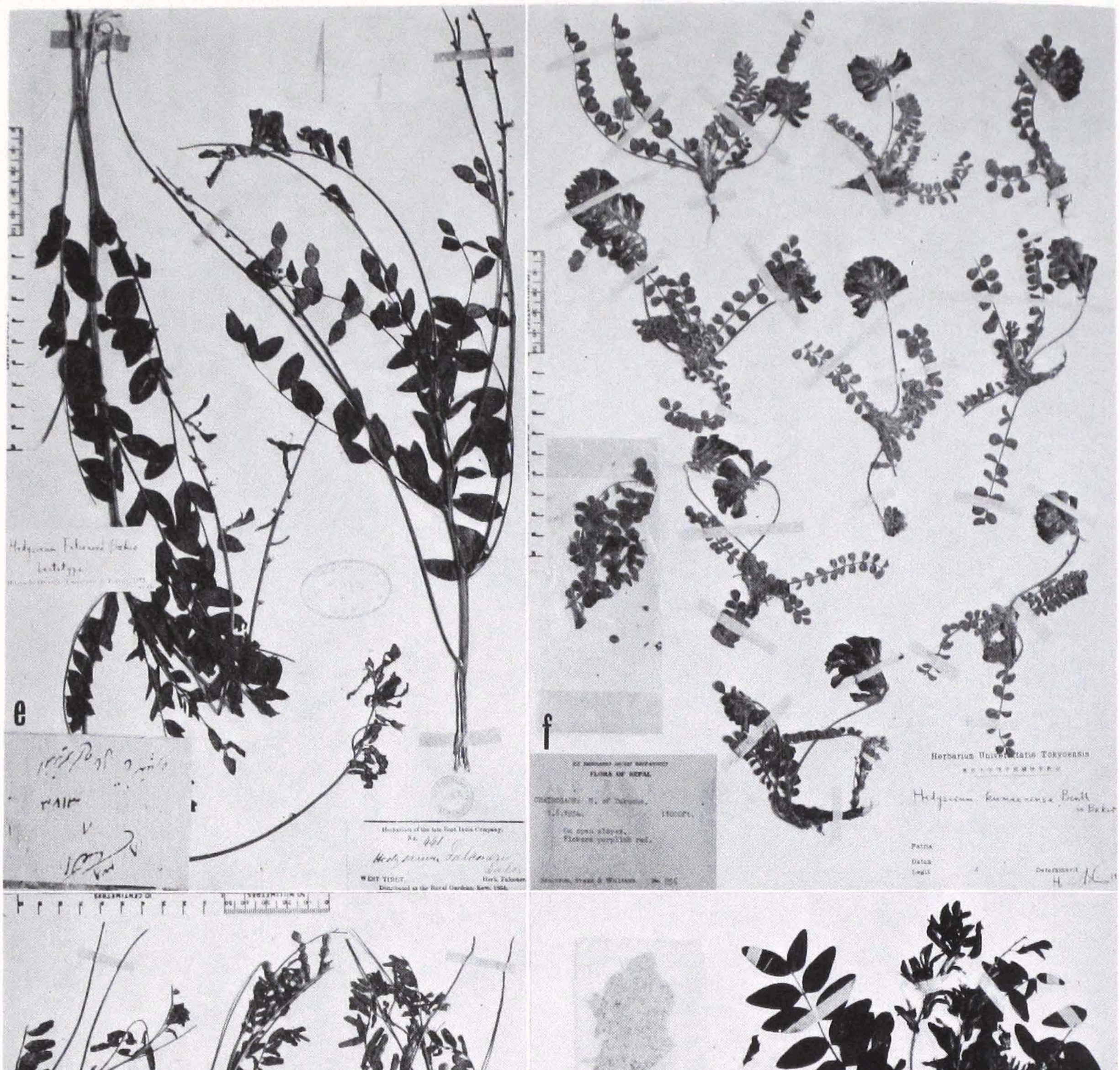
a – d. *Sedum crenulatum*



Himalayan *Hedysarum* (1) a. *H. astragaloides* b. *H. campylocarpon*

c. *H. microcalyx* d, d'. *H. cachemirianum*

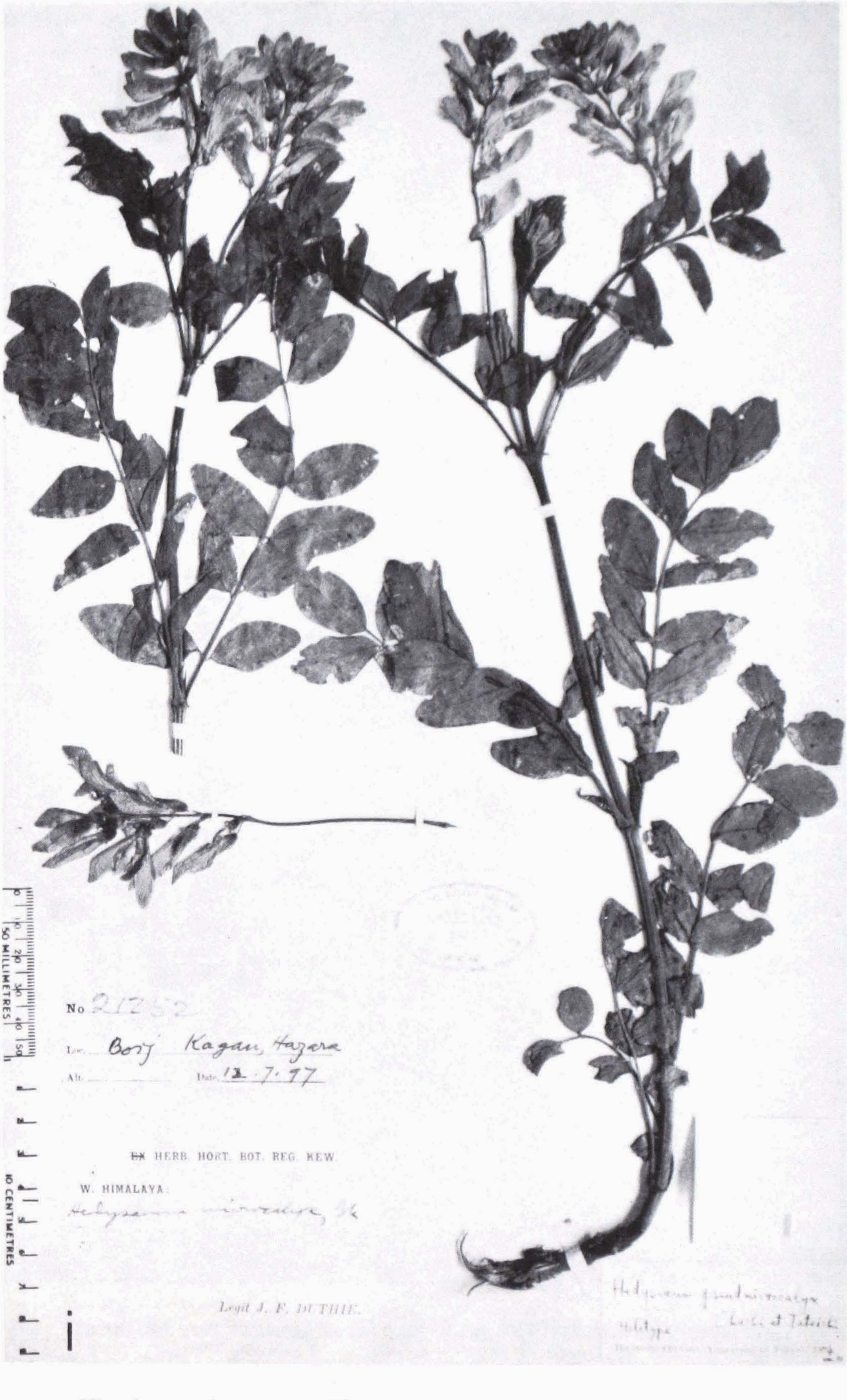
Plate 13


e
f
g
h
FLORA OF NEPAL
Herbarium Universitatis Tokyoensis
Ex Herbario Musei Britannici
BRITISH MUSEUM EXPEDITION TO NEPAL 1950
WEST TIBET
Typus

Himalayan *Hedysarum* (2) e. *H. Falconeri* f. *H. kumaonense*

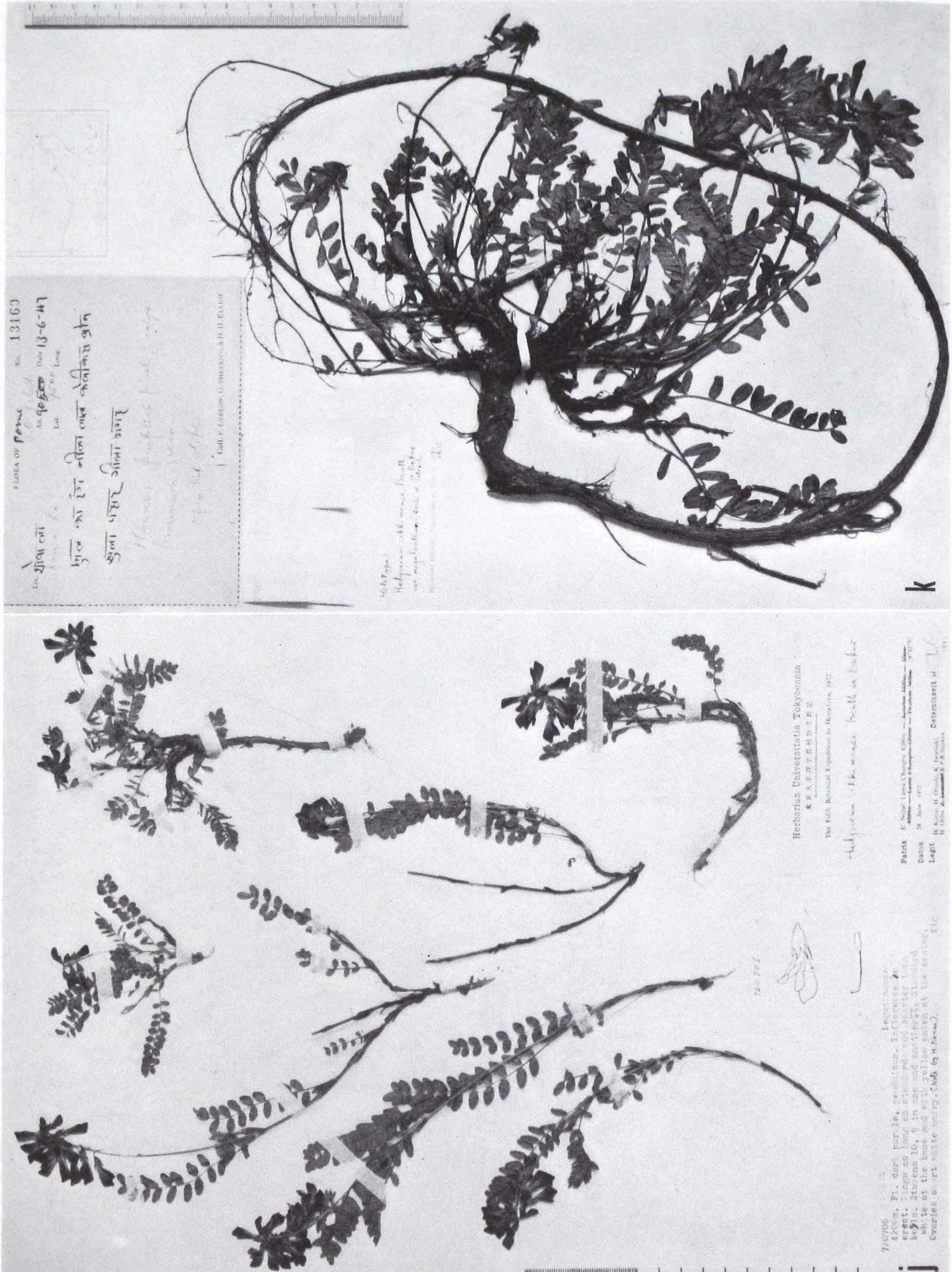
g. *H. alpinum* subsp. *laxiflorum* h. *H. manaslense*

F



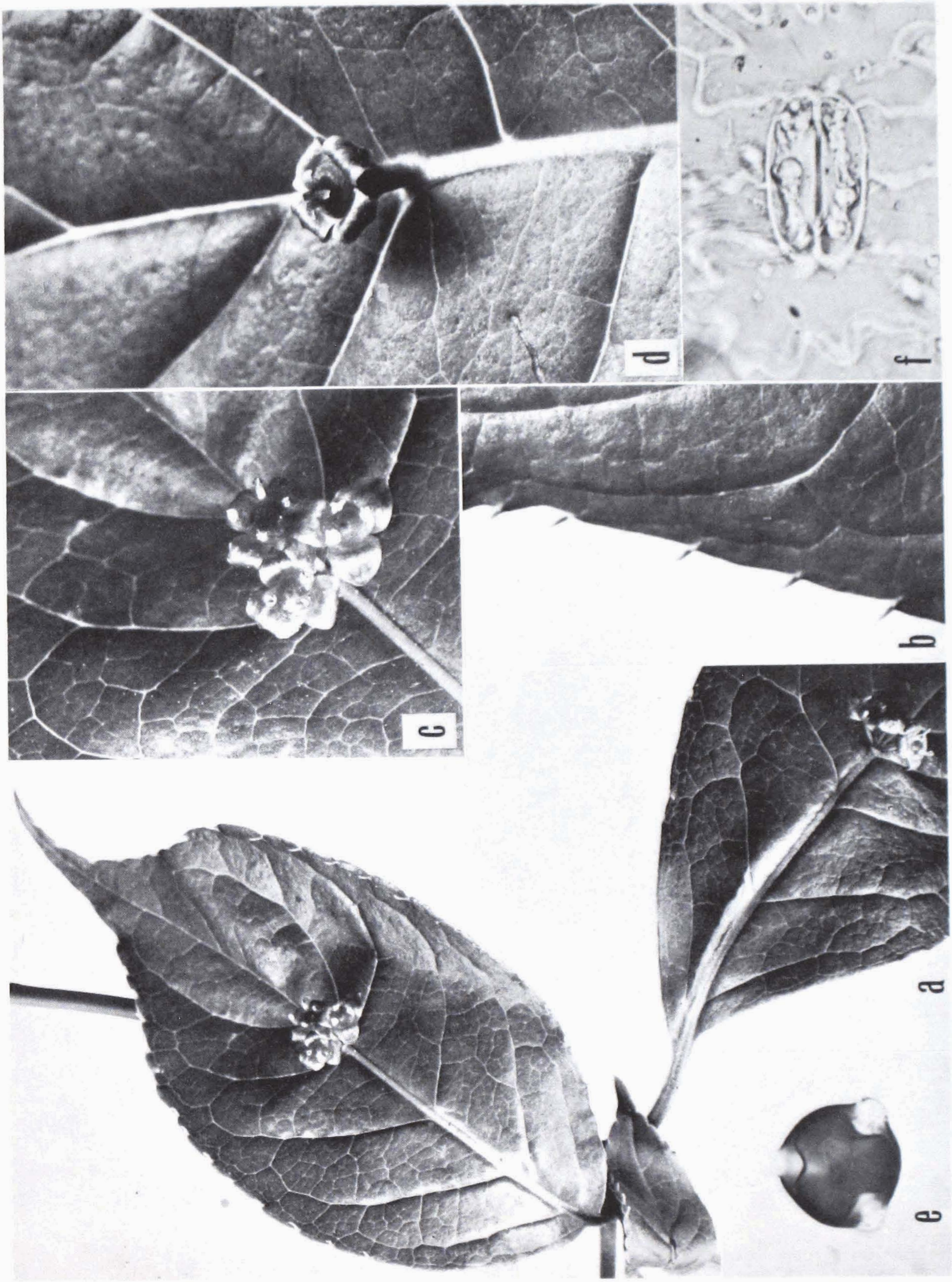
Himalayan *Hedysarum* (3) i. *H. pseudomicrocalyx*

Plate 15

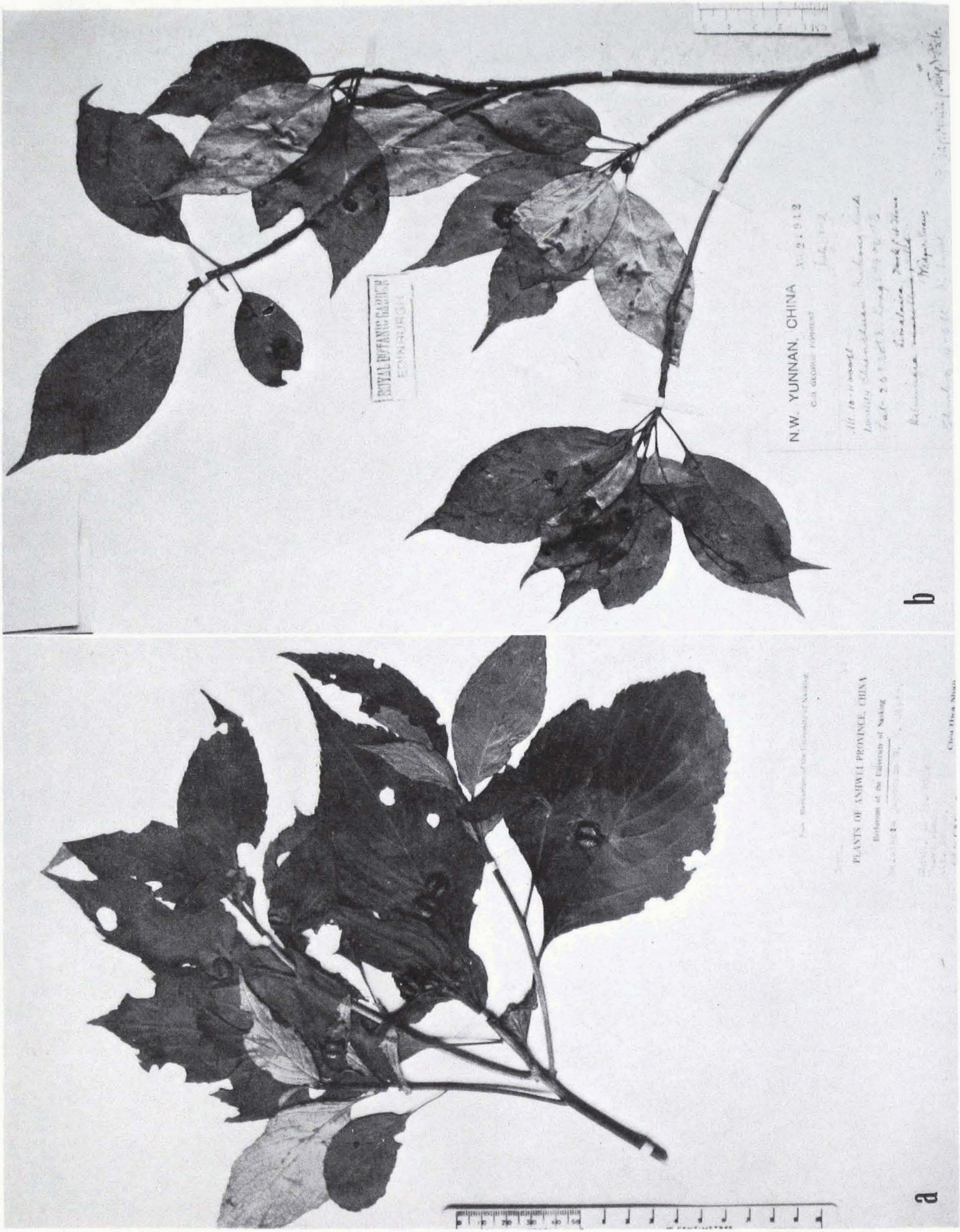


Himalayan *Hedysarum* (4) j. *H. sikkimense* var. *sikkimense*

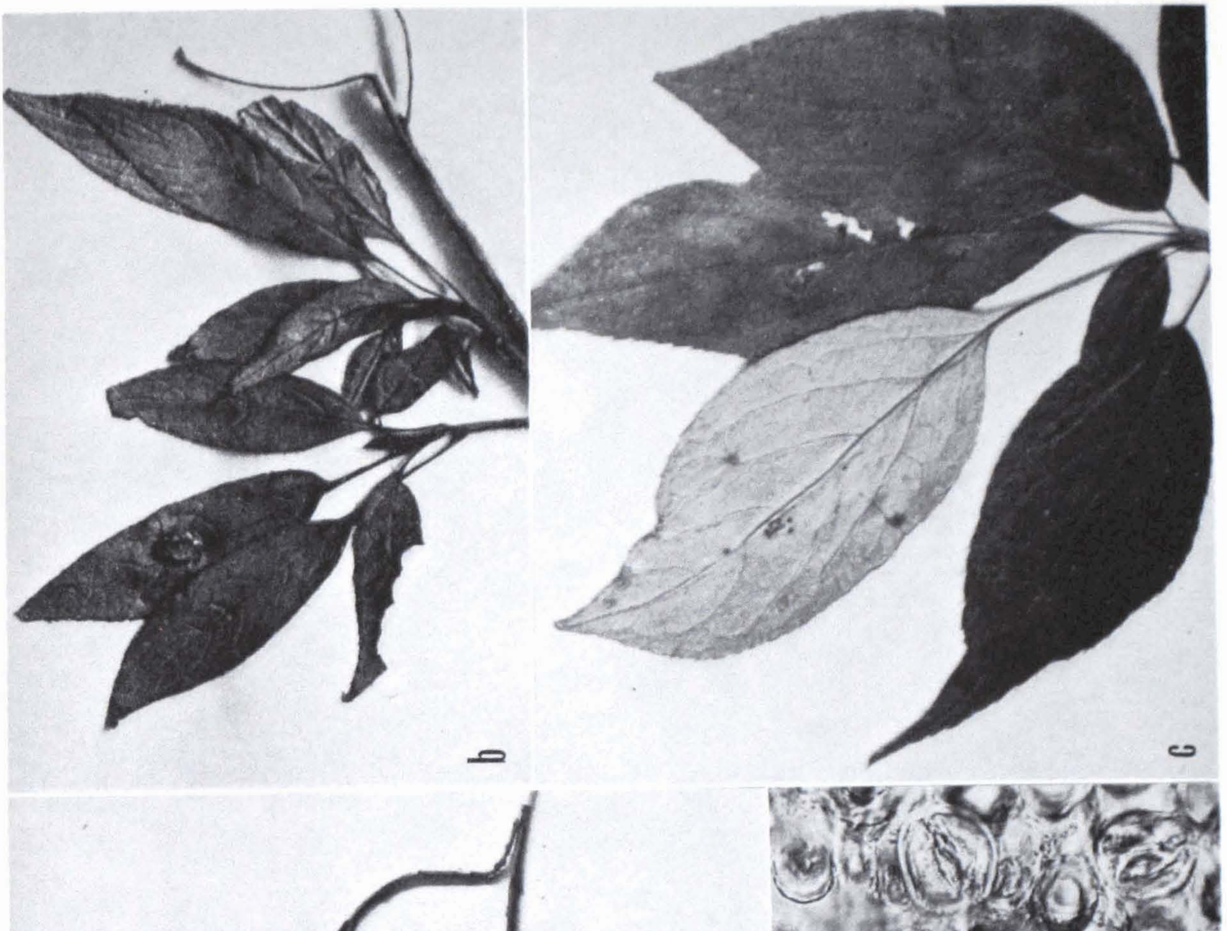
k. *H. sikkimense* var. *megalanthum*



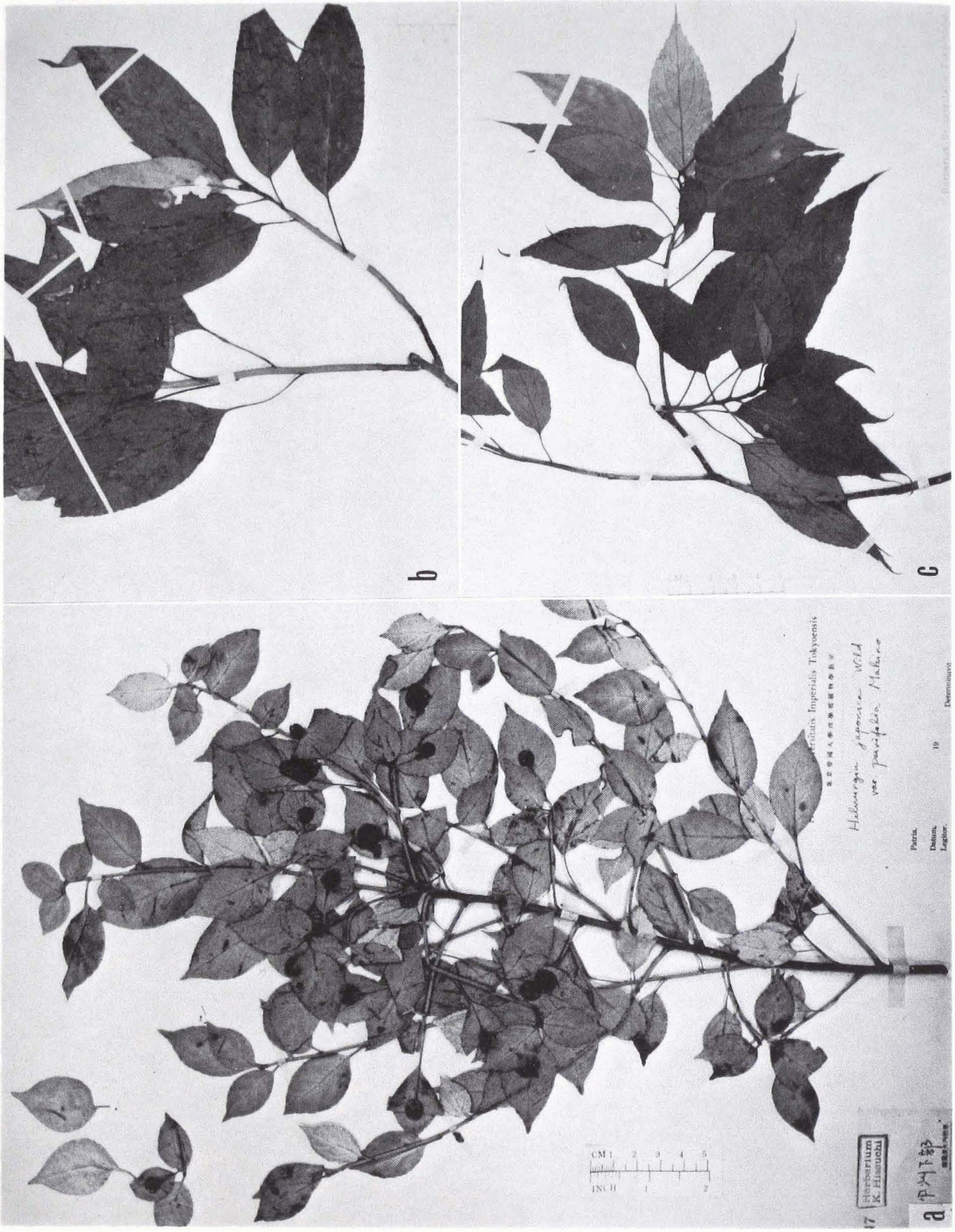
a – f. *Helwingia japonica*


b
N.W. YUNNAN, CHINA
ROYAL BOTANIC GARDEN EDINBURGH
a
PLANTS OF ANHWEI PROVINCE, CHINA
Herbarium of the University of Nanking

a, b. *Helwingia japonica* from China



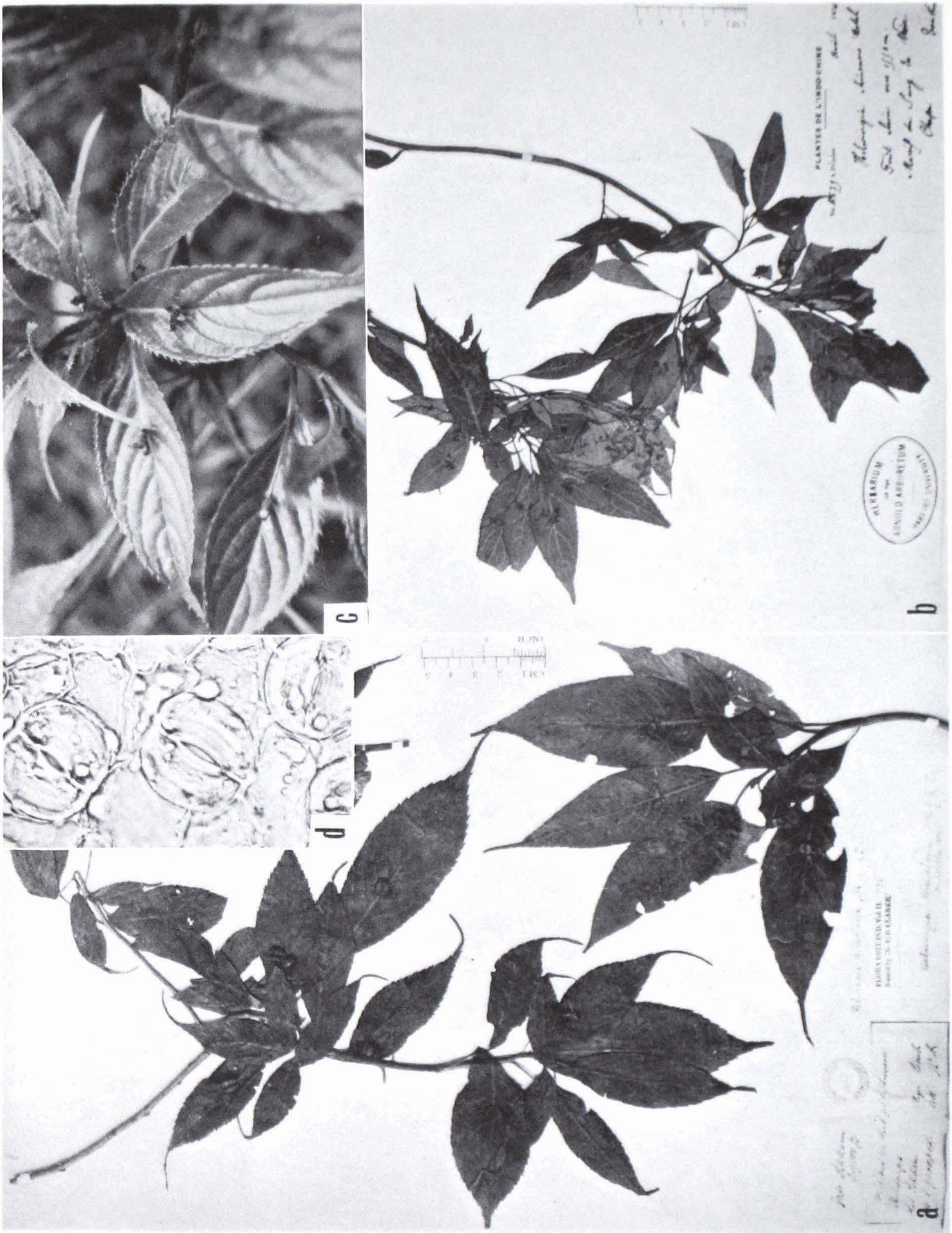
a, b. *Helwingia japonica* var. *nanchuanensis* c, d. *H. japonica* var. *hypoleuca*



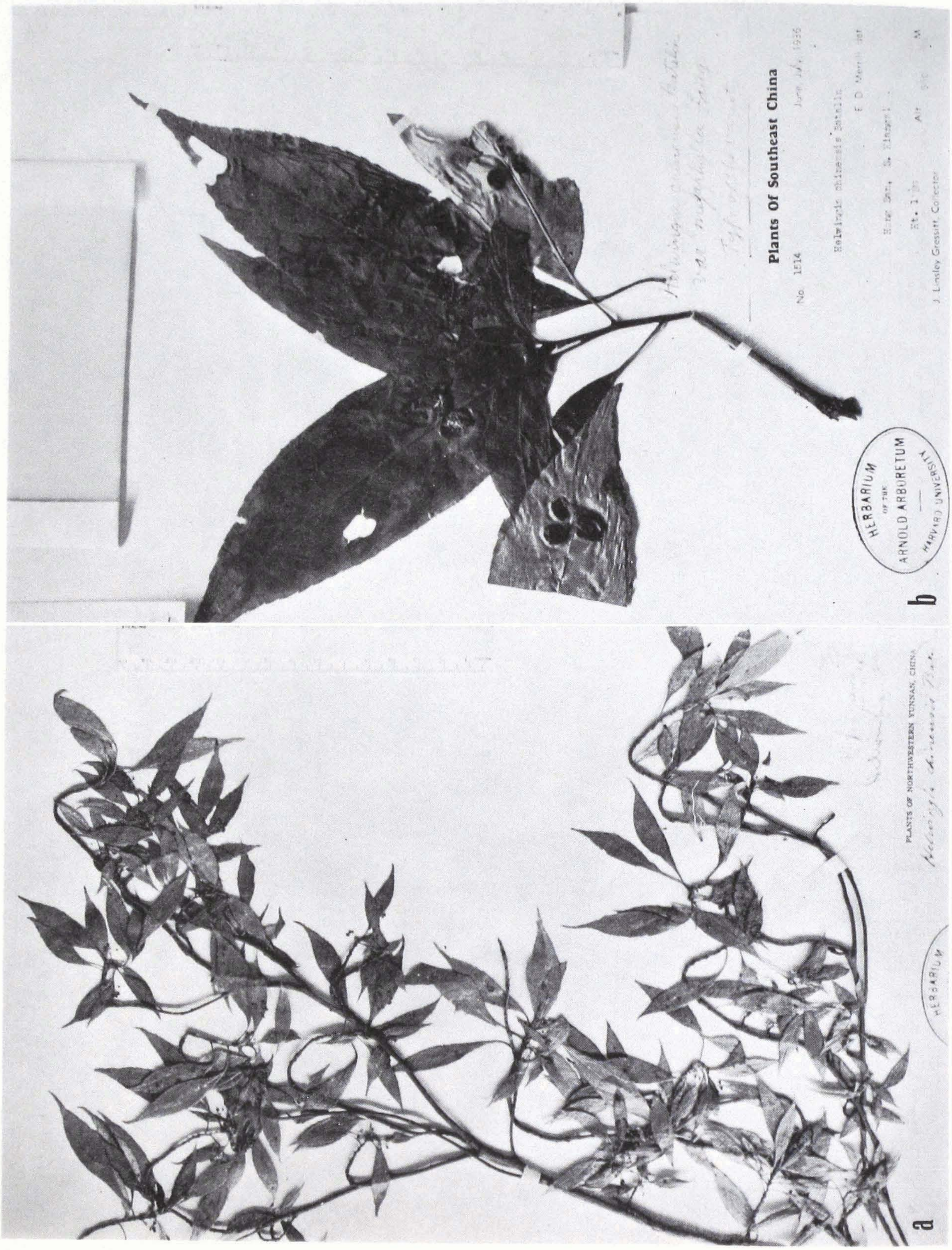
a. *Helwingia japonica* var. *parvifolia* b. *H. japonica* subsp. *liukiuensis*

c. *H. japonica* subsp. *formosana*

Pl

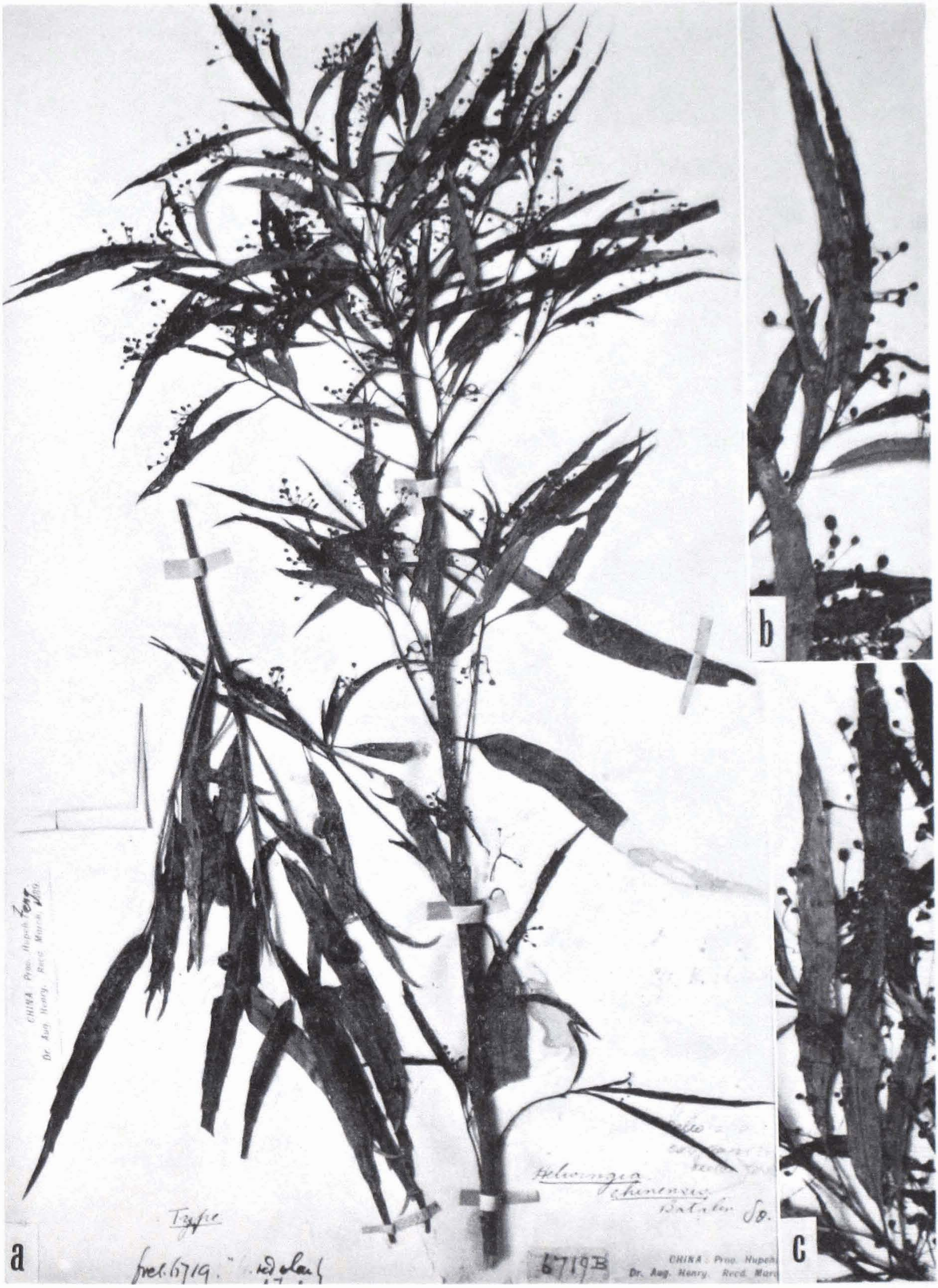


a — d. *Helwingia himalaica*

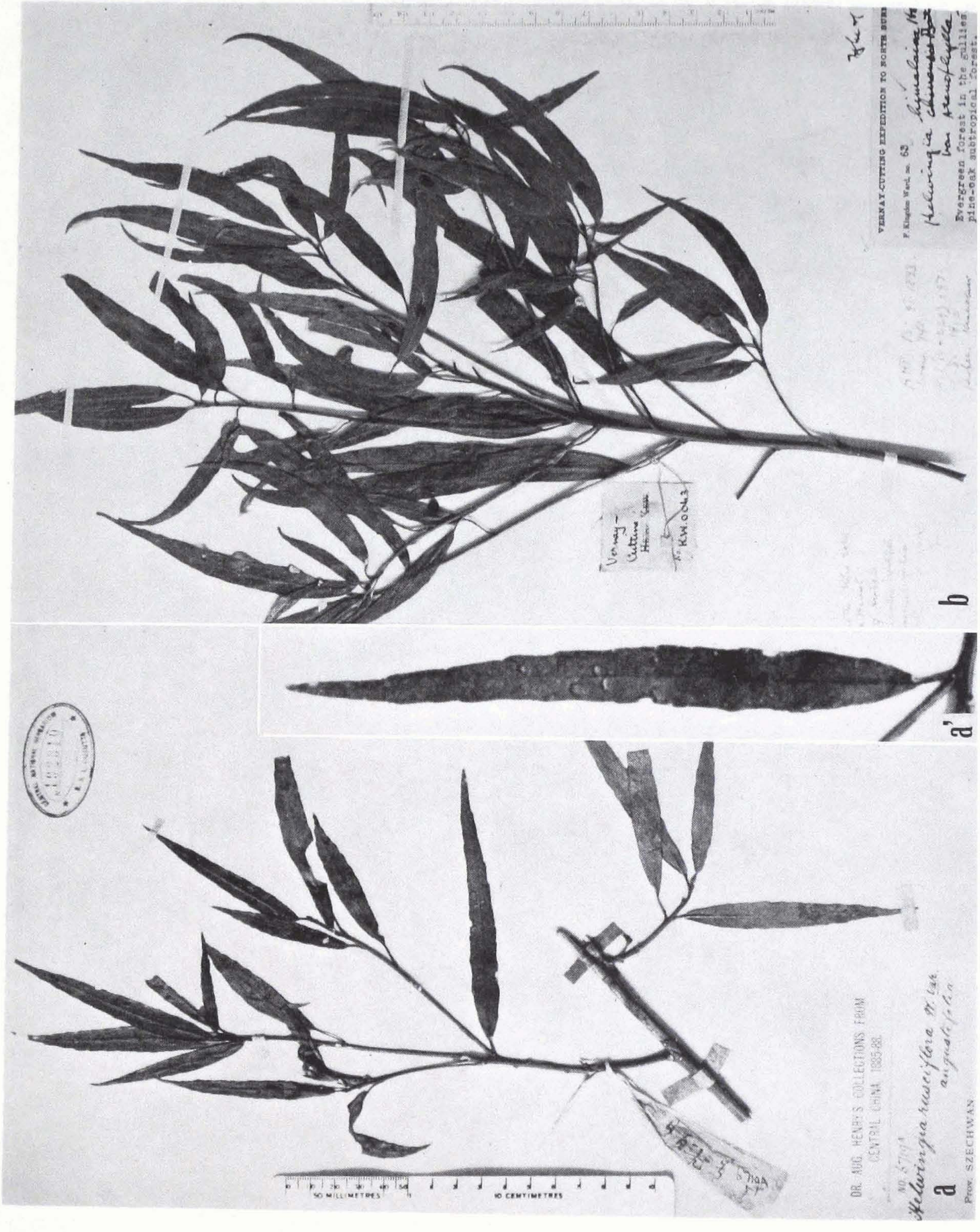

b
Plants Of Southeast China
No. 1514
Helwingia chinensis Batalin
F. D. Merrill det.
J. Linsley Gressitt, Collector
HERBARIUM OF THE ARNOLD ARBORETUM HARVARD UNIVERSITY
a
PLANTS OF NORTHWESTERN YUNNAN, CHINA
HERBARIUM

a. *Helwingia himalaica* var. *parvifolia*

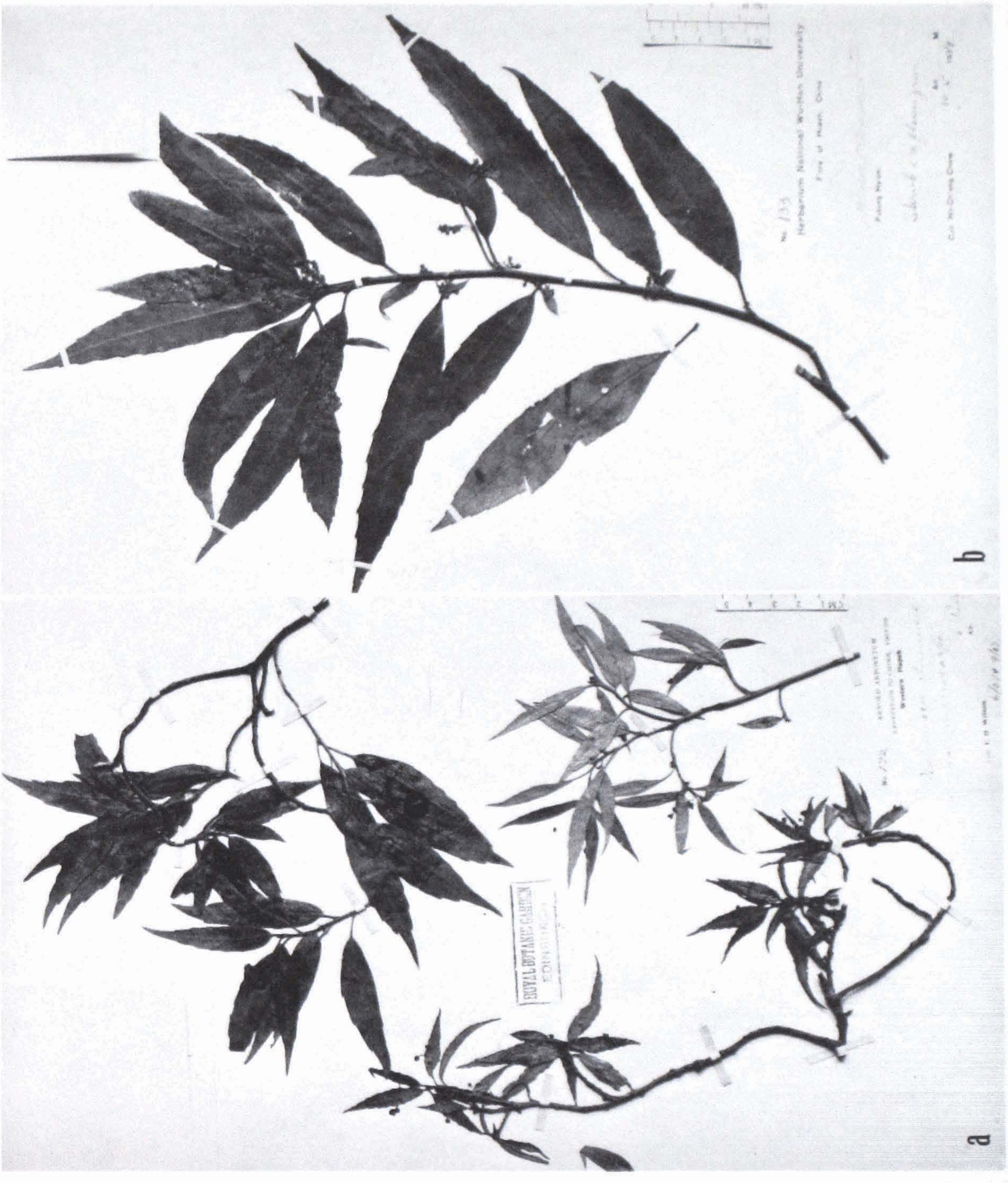
b. *H. chinensis* f. *megaphylla*



a – c. *Helwingia chinensis*

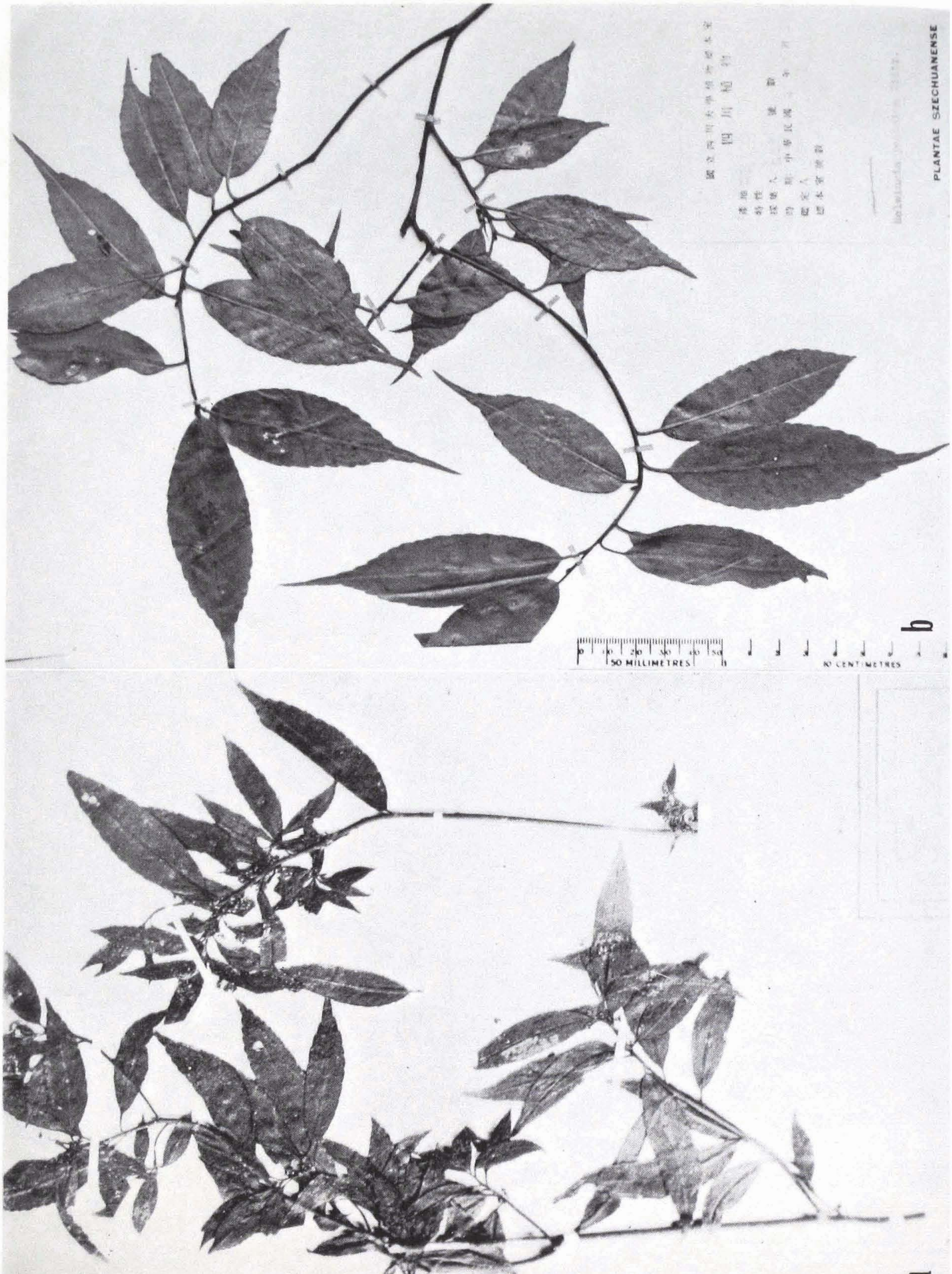

a
a'
b
DR. AUG. HENRY'S COLLECTIONS FROM CENTRAL CHINA 1885-88.
Prov. SZECHWAN
50 MILLIMETRES
10 CENTIMETRES
VERNAY-CUTTING EXPEDITION TO NORTH BUR
Evergreen forest in the gullies; pine-oak subtropical forest.

a, a' & b. *Helwingia chinensis*

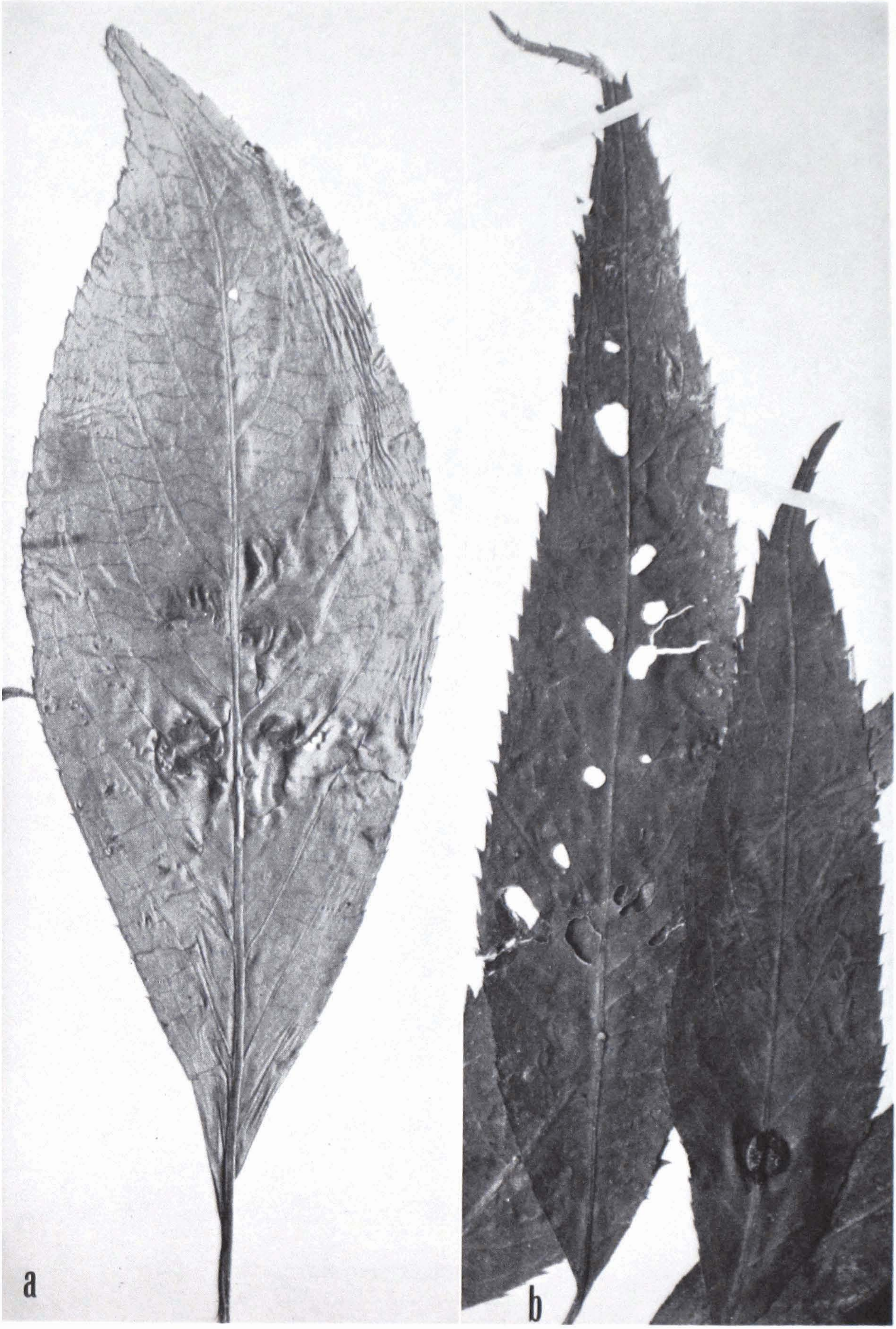

b
a
ROYAL BOTANIC GARDEN EDINBURGH
Herbarium National Wu-Han University
Flora of Hupeh, China

a, b. *Helwingia chinensis*

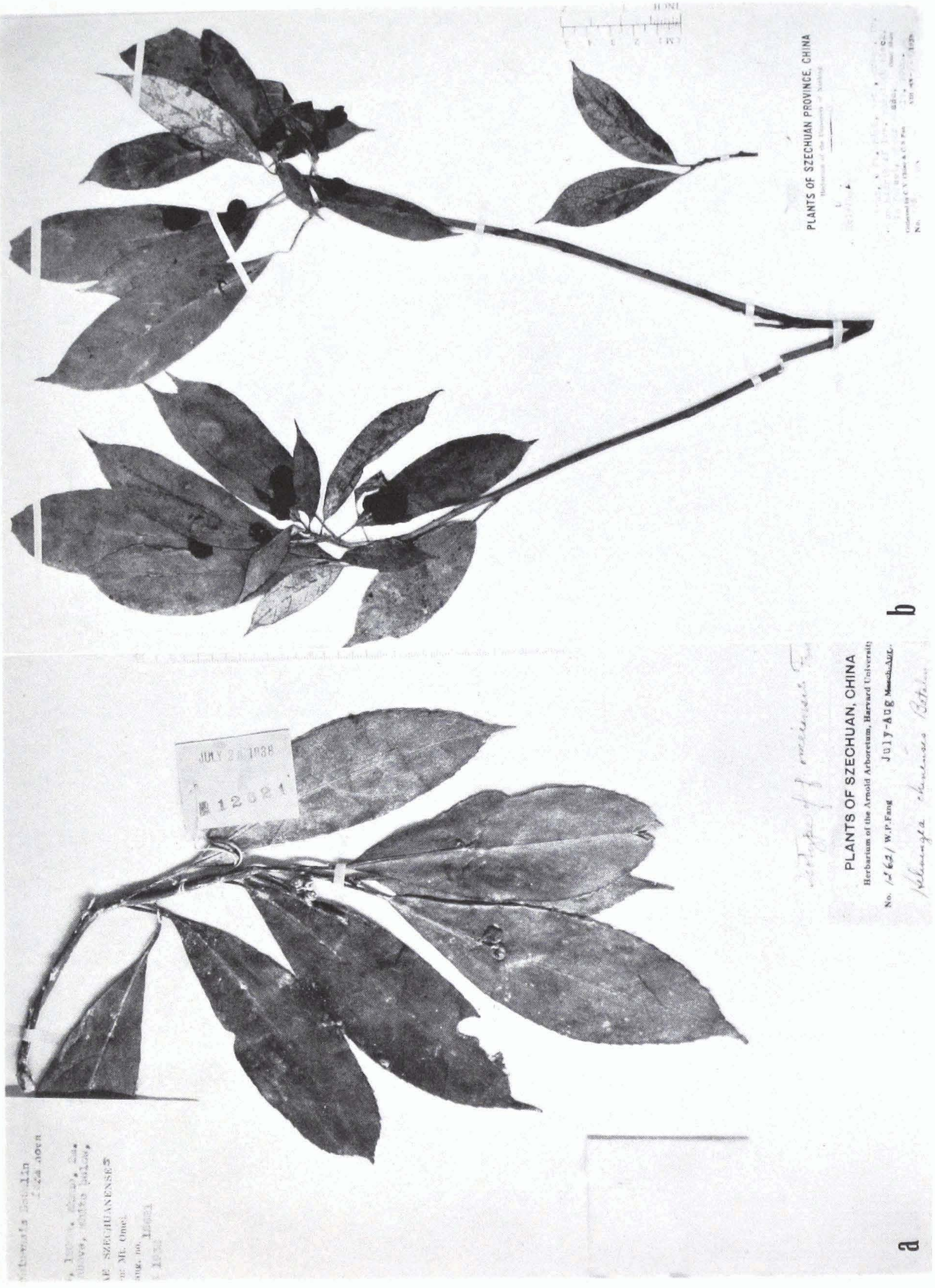
Plate 25



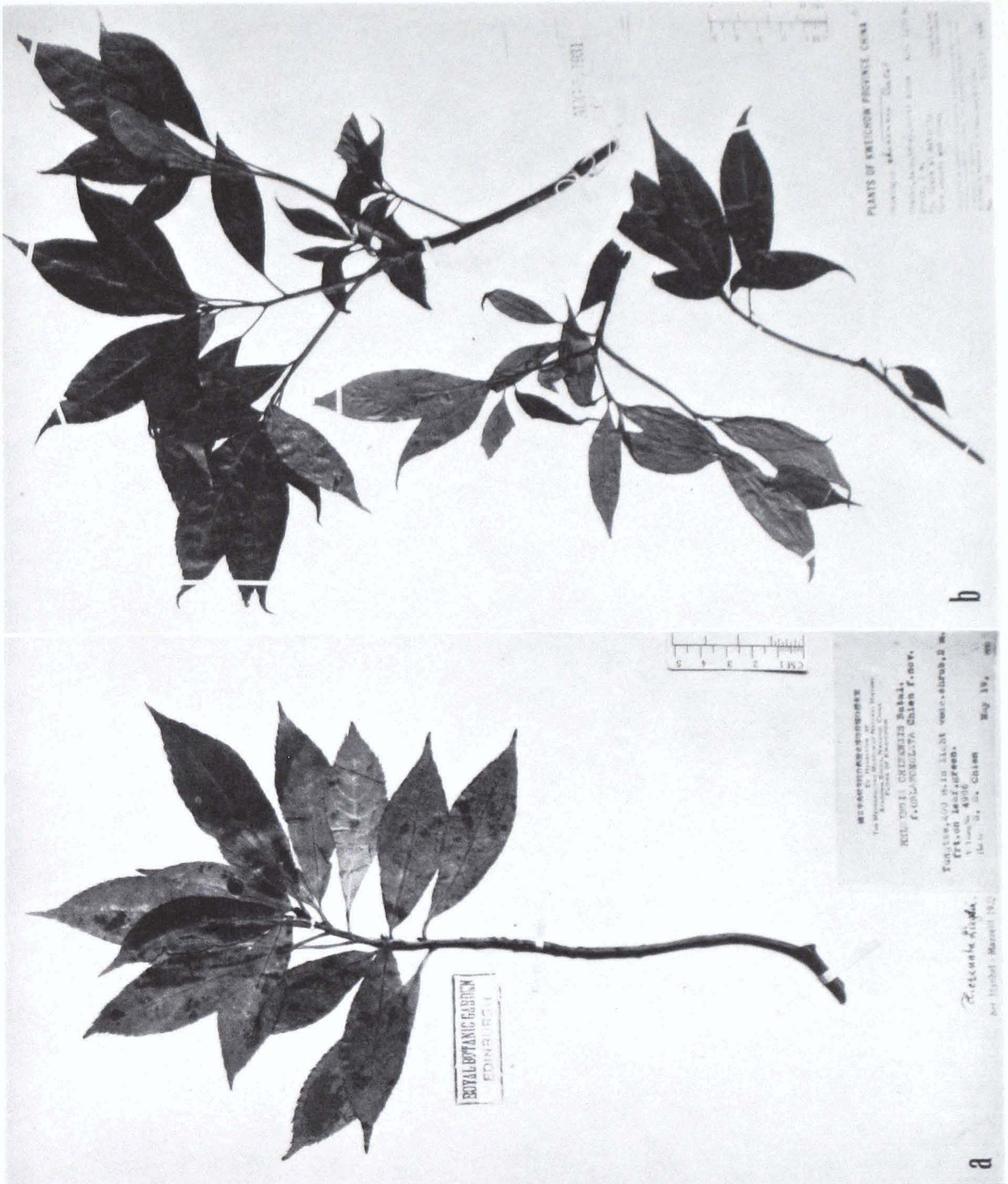
a, b. *Helwingia chinensis* var. *crenata*



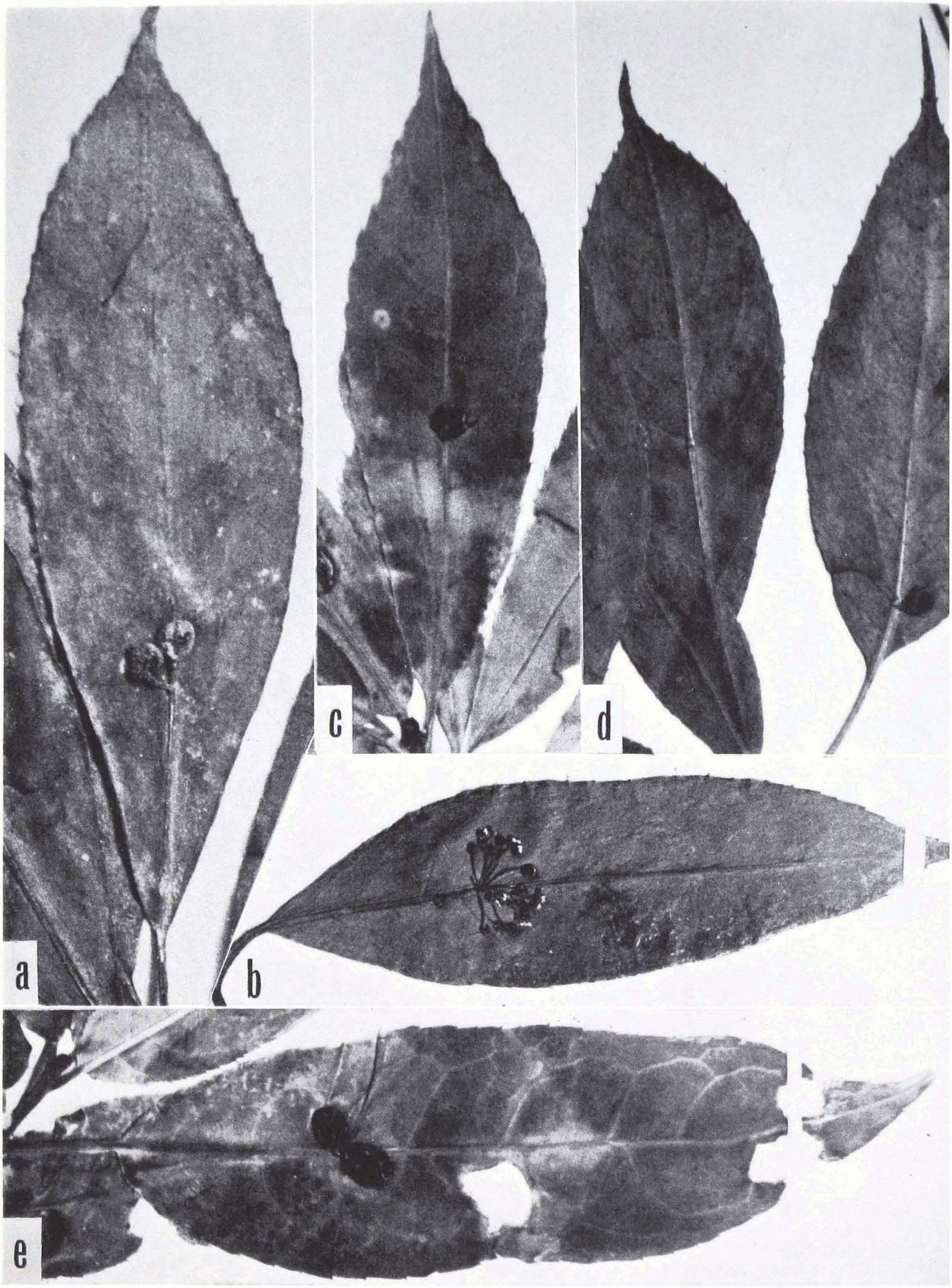
a, b. *Helwingia chinensis*


a
b
PLANTS OF SZECHUAN PROVINCE, CHINA
PLANTS OF SZECHUAN, CHINA
Herbarium of the Arnold Arboretum, Harvard University
July-Aug
JULY 28 1938
12621

a, b. *Helwingia omeiensis*

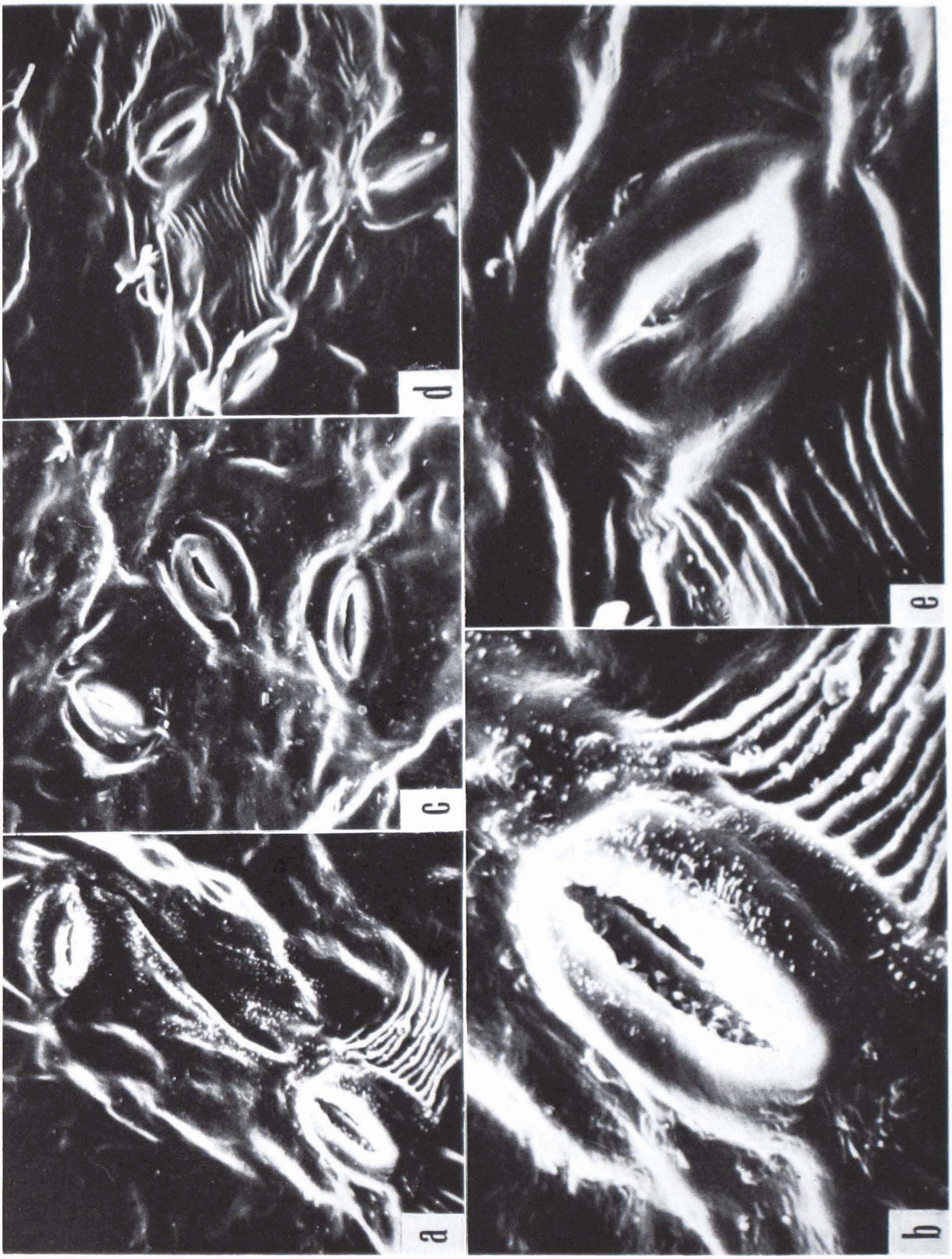


a, b. *Helwingia omeiensis* var. *oblanceolata*



a, b. *Helwingia omeiensis* var. *omeiensis*

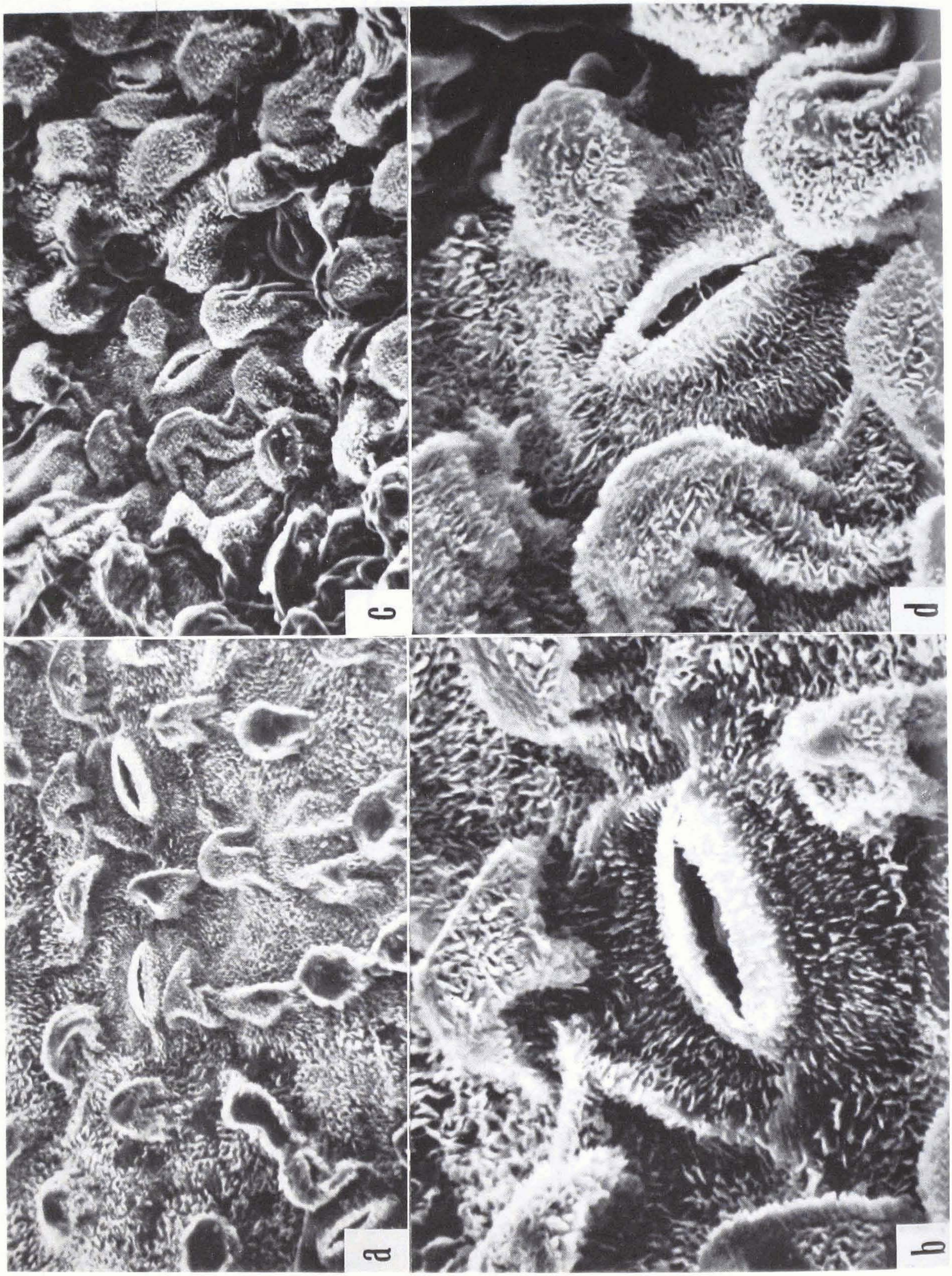
c – e. *H. omeiensis* var. *oblanceolata*



Scanning electron micrographs of the undersurface of leaf

a. *Helwingia japonica* x 710
b. The same x 2100
c. *Helwingia japonica* subsp. *liukiuensis* x 710
d. *Helwingia himalaica* x 710
e. The same x 2100

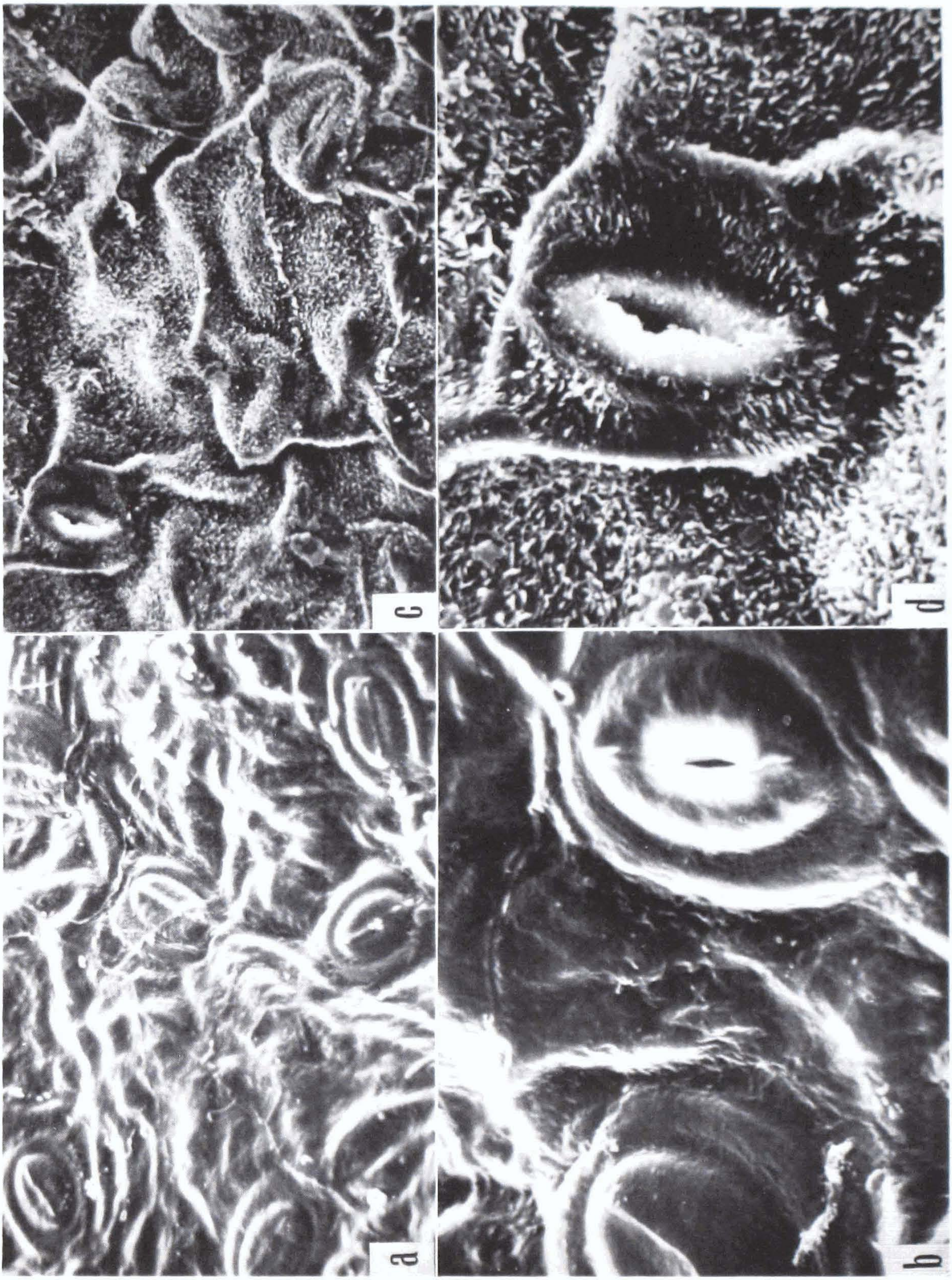
Plate 31



Scanning electron micrographs of the undersurface of leaf

a. *Helwingia japonica* var. *hypoleuca* x 710 b. The same x 2100

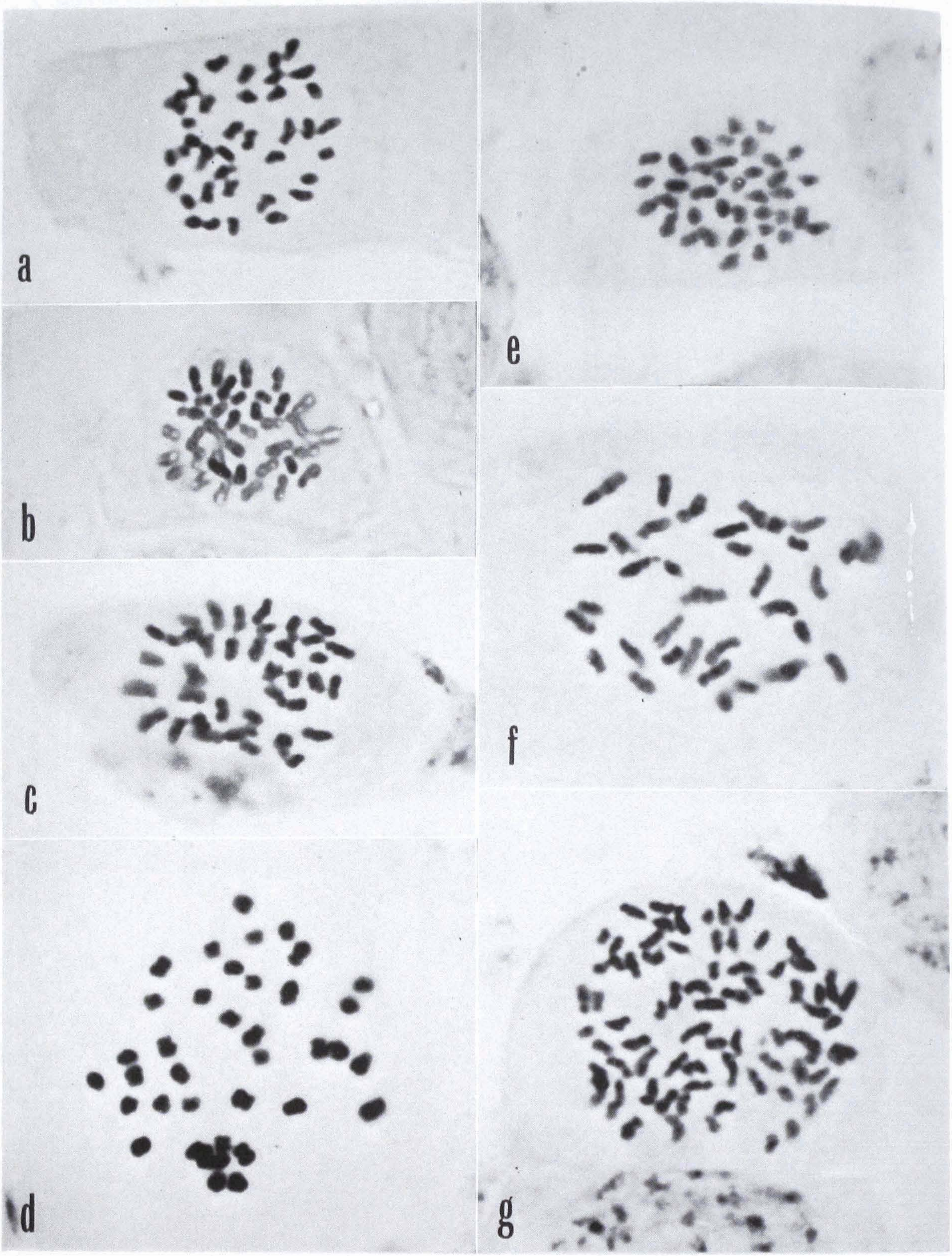
c. *Helwingia japonica* var. *nanchuanensis* x 710 d. The same x 2100



Scanning electron micrographs of the undersurface of leaf

Helwingia omeiensis a, c. x 710 b, d. x 2100

Plate 33



Micrographs of somatic chromosomes of *Helwingia* × 1900

a. *H. himalaica*

b. *H. japonica* var. *hypoleuca*

c, d. *H. japonica* var. *parvifolia*

e. *H. japonica* subsp. *formosana*

f. *H. japonica* subsp. *liukiuensis*

g. *H. japonica* var. *parvifolia*

MEMBERS AND ITINERARIES

FIFTH BOTANICAL EXPEDITION TO EASTERN HIMALAYA 1972

Members of the Expedition

Hiroo Kanai	Department of Botany, University Museum, University of Tokyo
Hiroyoshi Ohashi	Department of Botany, Faculty of Science, University of Tokyo
Hiroshi Hara	University of Tokyo
Hideaki Ohba	Botanical Garden, Faculty of Science, Tohoku University
Kunio Iwatsuki	Department of Botany, Faculty of Science, Kyoto University
Zennoske Iwatsuki	Hattori Botanical Laboratory

Informations on the members and itineraries of the Botanical Expeditions between 1960 and 1969 are given in the preceding volumes of "Flora of Eastern Himalaya" on pages 1–12 (1966) and second report: 1–9 (1971).

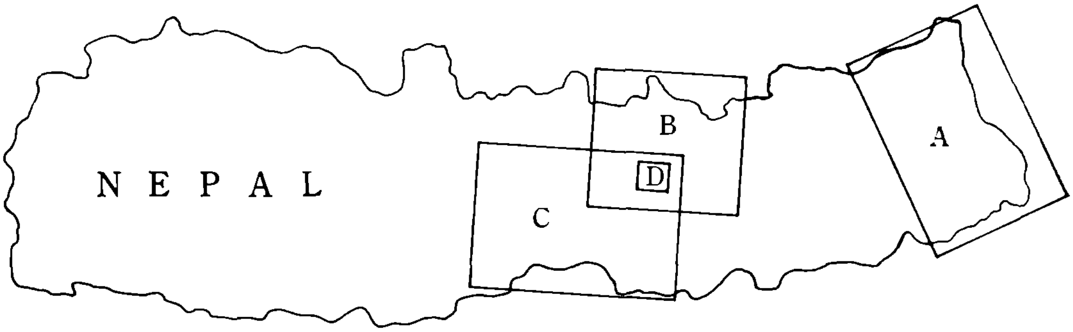


Fig. 1. Nepal showing the area investigated.

Itineraries of the Expedition

Abbreviations of the members: Hara (*H*), K. Iwatsuki (*Ik*), Z. Iwatsuki (*Iz*), Kanai (*K*), Ohashi (*O*), Ohba (*Ob*) and Shakya (*S*)[1].

Itinerary of the first trip in Eastern Nepal (Fig. 2).

May	23	1972	*KOOb*	→ Kathmandu
	28		*OOb*	Phulchoki, 2700 m
	29		*IkIz*	→ Kathmandu
	30		*OObS*	Kathmandu—Biratnagar—Dharan
	31		*IkIzK*	Kathmandu—Biratnagar—Dharan

---

[1] Mr. P. R. Shakya, Department of Medicinal Plants, H.M.G. of Nepal, joined the first trip from May 30 until July 11.

June	1	1972	*IkIzKOObS*	South of Dharan, 200 m
	2			Dharan, 400 m—Sanguri Bhanjyang, 1300 m—Dhara Pani, 1000 m
	3			Dhara Pani, 1000 m—Mohamabedi Khola, 400 m—Tamur Bridge, 300 m—Teku Nala, 800 m
	4			Teku Nala, 800 m — Dhankuta, 1300 m — Nigale, 1600 m—Kuwa Pani, 1900 m—Hile, 1900 m
	5			Hile, 1900 m—Mure, 2100 m—Sinduwa, 2100 m—Bhalukhop, 2400 m—Chitre, 2400 m
	6			Chitre, 2400 m—Basantapur (Bilbatay Bhanjyang), 2300 m—Tute, 2300 m—Dor, 2600 m
	7			Dor, 2600 m — Tinjure, 2900 m — Tinjure Phedi, 2700 m—Chauke, 2700 m
	8			Chauke, 2700 m—Mangalbare, 2600 m—Lamo Pokhari, 2900 m
	9			Lamo Pokhari, 2900 m
	10			Lamo Pokhari, 2900 m—Gupha Pokhari, 2900 m—Suke, 2900 m
	11			Suke, 2900 m—Kokim Pokhari, 3000 m—Hati Surde, 3600 m—Hile Chok, 3500 m
	12			Hile Chok, 3500 m—Ghopte (Tal Pokhari), 3500 m
	13			Ghopte, 3500 m — Gosa, 4100 m
	14			Gosa, 4100 m—Banduke Pokhari (Duo Tulo Pokhari), 4200 m
	15			Banduke Pokhari, 4200 m—Saju Pokhari, 4000 m
	16			Saju Pokhari, 4000 m—4400 m—Topke Gola, 3600 m
	17–19			Topke Gola, 3600 m
	20			Topke Gola, 3600 m—Jalang Chhyongo, 4300 m
	21			Jalang Chhyongo, 4300 m — Janga La, 4600 m — Thudam, 3400 m
	22			Thudam, 3400 m
	23			Thudam, 3400 m—Lama Chungbu, 4200 m
	24			Lama Chungbu, 4200 m—Samdan, 4400 m—Slesa, 4500 m—Lama Chungbu, 4200 m—Thudam
	25			Thudam, 3400 m
	26			Thudam, 3400 m — Kipudonsu, 4200 m — Kipuphu, 4500 m
	27			Kipuphu, 4500 m—Phujeng La, 4800 m—Topke Gola, 3600 m
	28			Topke Gola, 3600 m—Shewaden, 2600 m
	29			Shewaden, 2600 m—Mewa Khola, 2100 m—Papung, 2000 m
	30			Papung, 2000 m—Bir Gaon, 1600 m
July	1			Bir Gaon, 1600 m — Saju Khola, 1400 m — Dingla, 1000 m
	2			Dingla, 1000 m—Doban, 800 m—Nessum, 1300 m

July	3	1972	*IkIzKOObS*	Nessum, 1300 m—Puntapla, 2000 m—Gorza Gaon, 2000 m—Bhuje, 2700 m
	4			Bhuje, 2700 m—Gupha Pokhari, 2900 m—Lamo Pokhari, 2900 m—Chauke, 2700 m
	5			Chauke, 2700 m
	6			Chauke, 2700 m—Tinjure Phedi, 2700 m—Tinjure, 2900 m—Dor, 2600 m
	7			Dor, 2600 m—Tute, 2300 m—Basantapur, 2300 m—Chitre, 2400 m
	8			Chitre, 2400 m—Hile, 1900 m—Dhankuta, 1300 m—Teku Nala, 800 m
	9			Teku Nala, 800 m—Tamur Bridge, 300 m—Mohamabedi Khola, 400 m—Dhara Pani, 1000 m
	10			Dhara Pani, 1000 m—Sanguri Bhanjyang, 1300 m—Dharan, 400 m—Biratnagar
	11			Biratnagar—Kathmandu
	12		*H*	→ Kathmandu
	15		*HIkIzOb*	Phulchoki, 2700 m
	18		*IkKOOb*	Kathmandu—Calcutta
	19		*H*	Kathmandu—Calcutta *Iz* Kathmandu →

Itinerary of the second trip in Darjeeling and the Singalila Range (Fig. 2).

July	21	1972	*HIkO*	Calcutta—Darjeeling, 2200 m
	22			Darjeeling (East Birch Hill Road, 2100 m)
	23			Darjeeling
	24			Darjeeling (Victoria Fall, 2100 m)
	25			Darjeeling (Ubayuri-dani, 2200 m)
	26–29			Darjeeling 28 *KOb* Calcutta—Darjeeling
	30		*HIkKOOb*	Mani Bhanjyang, 2000 m—Mekma, 2600 m—Tonglu, 3000 m
	31			Tonglu, 3000 m—Gairibas, 2800 m—Kala Pokhari, 3000 m—Sandakphu, 3600 m
August	1			Sandakphu, 3600 m
	2			Sandakphu, 3600 m—Sabargam, 3200 m—Phalut, 3600 m
	3			Phalut, 3600 m—Singalila, 3700 m
	4			Phalut, 3600 m—Ratho Chu, 2100 m—Raman
	5			Raman, 2400 m—Siri Khola, 1900 m—Rimbick
	6			Rimbick, 2200 m—Lodhoma Khola, 1500 m—Palmajua, 2200 m
	7			Palmajua, 2200 m
	8			Palmajua, 2200 m—Batasi, 2100 m
	9			Batasi—Mani Bhanjyang, 2000 m—Darjeeling
	10		*IkOOb*	Darjeeling, 2200 m—Ghum, 2300 m—Simkuna, 2200 m—Thame, 2000 m—Lopchu, 1500 m—Tista, 400 m, and return

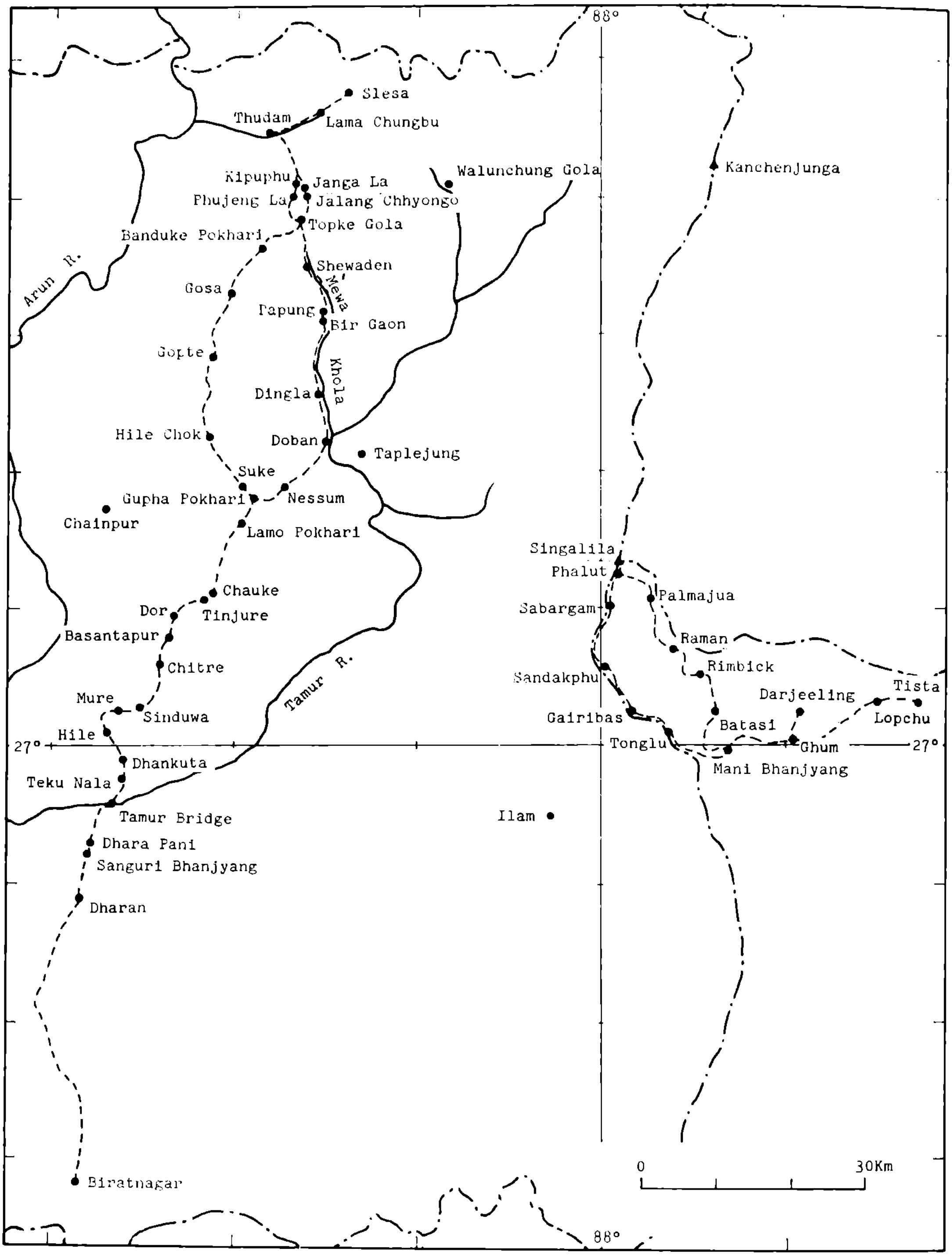


Fig. 2. Sketch map of Eastern Nepal, Darjeeling and the Singalila Range (Fig. 1, A) showing localities of the first and second trips in 1972.

August	11 1972		Darjeeling, 2200 m
	12	*KOb*	Darjeeling—Ghum, 2300 m — Simkuna — Thame, 2000 m—Lopchu, 1500 m, and return
	13	*HIkO*	Darjeeling—Calcutta
	13–15	*KOb*	Darjeeling—Raxaul—Birganj—Kathmandu
	16	*H*	Calcutta—Kathmandu
	17	*IkO*	Calcutta →

Itinerary of the third trip in Central Nepal (Fig. 3).

August	19	1972	*HKOb*	Kathmandu—Bainse, 600 m—Betrawati, 700 m—Sim Chotala, 900 m
	20			Sim Chotala—Ramche, 1800 m—Gram, 1900 m
	21			Gram, 1900 m—Thale, 1900 m—Dunche, 2000 m
	22			Dunche, 2000 m — Trisuli Khola, 1900 m — Singum Gompa, 3200 m
	23			Singum Gompa, 3200 m—Gosainkund, 4200 m
	24			Gosainkund, 4000—4400 m
	25			Gosainkund, 4200 m — Surjakund, 4400 m — Gopte, 3500 m
	26			Gopte, 3500 m—Thale Patil, 3400 m
	27			Thale Patil, 3400 m—Hile Dhap, 3400 m—Mangen, 3100 m
	28			Mangen, 3100 m—Khodang Danda, 2500 m
	29			Khodang Danda, 2500 m—Gul Bhanjyang, 2100 m—Latsu, 2400 m
	30			Latsu, 2400 m—Pati Bhanjyang, 1700 m—Bhorlang, 2400 m
	31			Bhorlang, 2400 m—Sundarijar, 1400 m—Kathmandu
September	5		*HOb*	Kathmandu →
	6		*K*	Phulchoki, 2700 m
	8		*K*	Kathmandu →

* * * * *

The series of botanical trips made by Dr. Hiroo Kanai (*K*) with the staffs of the Department of Medicinal Plants, H.M.G. of Nepal, in 1969 and 1970.

Abbreviations of the staffs: A. Adhikary (*A*), Madhu Sudan Bista (*B*), Sunar B. Malla (*M*), Tirta Bahadur Shrestha (*Sh*), Puspa Ratna Shakya (*S*), and many staffs of the Department (*V*).

February	13	1969	*KV*	Sundarijar, Kathmandu, 1400 m
	18		*K*	Swayambhu Nath, Kathmandu, 1300 m
March	1		*K*	Nagarjun, Kathmandu, 1500 m
	6		*KV*	Sundarijar, Kathmandu, 1400 m
	8		*K*	Chobar, Kathmandu, 1300 m
	26-27		*K*	Bagdwar (Sheopuri), Kathmandu, 2500 m
April	5		*K*	Godawari, Kathmandu, 1500 m
	7		*K*	Nagarjun, Kathmandu, 1500 m
	11		*K*	Phulchoki, Kathmandu, 2700 m
	17		*BK*	Simra, 200 m—Patlaia, 200 m
	18			Patlaia, 200 m—Sakti Mohar Khola, 200 m—Nijgar 200 m
	19			Nijgar, 200 m—Bagdeo, 250 m—Saraswati, 600 m—Bakeya Khola, 300 m—Jaspar, 300 m
	20			Jaspar, 300 m—Jureli, 340 m—Phurke Chour, 370 m —620 m—Makwampur (Trisuli), 500 m

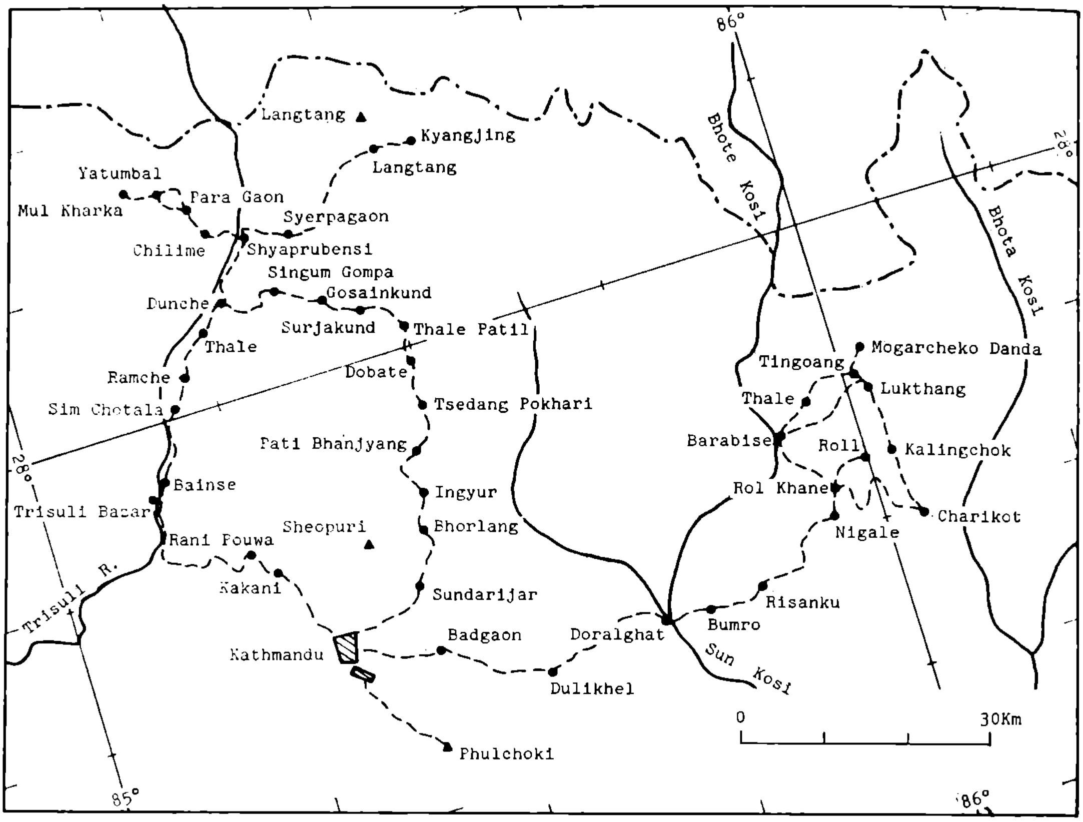


Fig. 3. Sketch map of northern Central Nepal (Fig. 1, B) showing localities of the third trip in 1972 and those of Dr. Kanai's trips in 1969 and 1970.

April	21	1969 *BK*	Makwampur, 500 m—Guwabaritola, 500 m—Dhara Pani, 300 m—Makwampur Garhi, 1100 m—Chandenitola, 1000 m
	22		Chandenitola, 1000 m—Dunge Garhi, 1200 m—Dhedre Khola, 700 m—Siwanta, 850 m
	23		Siwanta, 850 m–1250 m—Tsinging, 1200 m—Baguwa 900 m—Bagmati River, 750 m—Khani Khola, 760 m—Yaspa, 950 m
	24		Yaspa, 950 m—Chopli, 1500 m—Nigate (Timpani) Bhanjyang, 2000 m—Tikabhairab, 1500 m
	25		Tikabhairab, 1500 m—Lele, 1500 m—Naldu, 1900 m — Bhardeophedi, 1800 m — Khiraule Bhanjyang, 2250 m — Lele Bhanjyang, 2000 m — Godawari, 1500 m
June	1	*K*(1)	Bainse, 800 m—Sim Chotala, 900 m
	2		Sim Chotala, 900 m—Ramche, 1800 m—Thale, 2000 m
	3		Thale, 2200 m — Dunche, 2100 m — Trisuli Khola, 2000 m
	4		Trisuli Khola, 2000 m—Singum Gompa, 3200 m and return

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1) Joined the Fourth Botanical Expedition organized by the University of Tokyo.

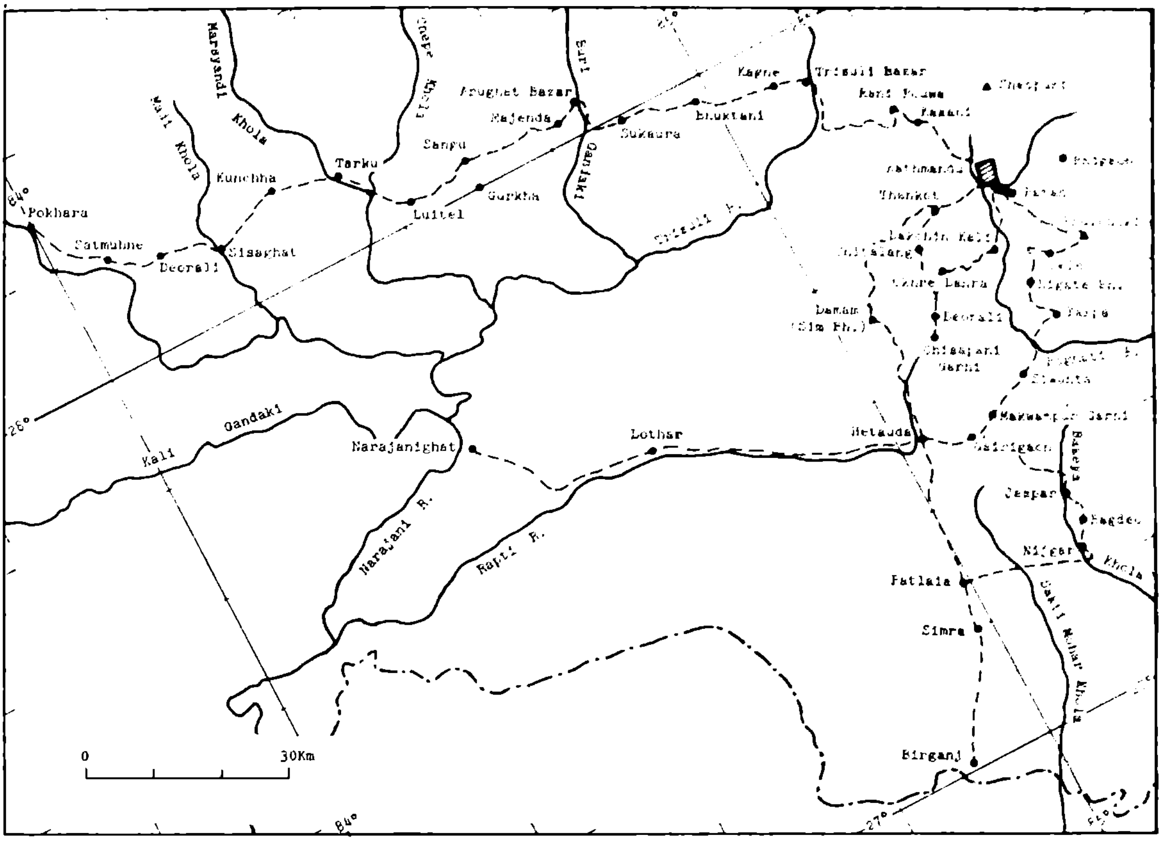

Fig. 4. Sketch map of southern Central Nepal (Fig. 1, C) showing localities of Dr. Kanai's trips in 1969 and 1970.

June	5 1969		Trisuli Khola, 2000 m—Dunche, 2100 m—Thale, 2200 m
	6		Thale, 2200 m—Gram, 1900 m—Ramche, 1800 m—Sim Chotala, 900 m
	7		Sim Chotala, 900 m—Bainse, 800 m
	10	*K*	Phulchoki, 2700 m
	14	*K*	Sheopuri, 2500 m
July	26	*K*	Sim Bhanjyang, 2500 m
August	9	*K*	Phulchoki, 2700 m
	20	*KM*	Sundarijar, 1380 m—Mul Kharka, 1850 m—Chipu Danda, 2390 m—Bhorlang, 2370 m
	21		Bhorlang, 2370 m — Pati Bhanjyang, 1750 m — Tanguni, 1840 m — Chipling, 2160 m — Latsu, 2440 m —Ingyur, 2240 m
	22		Ingyur, 2240 m—Gul Bhanjyang, 2100 m—Duche Gyang, 2250 m — Thodang Danda, 2400 m — Kutumsang, 2400 m—Tsedang Pokhari, 3000 m
	23		Tsedang Pokhari, 3000 m—Panghu Danda, 3120 m—Mere Danda, 3200 m—Mangen Bhanjyang, 3160 m —Dobate, 3230 m
	24		Dobate, 3230 m—Hile Dhap, 3340 m—Mane, 3550 m

				—Thale Patil, 3500 m—Rock Shelter I, 3270 m —Rock Shelter II, 3200 m
August	25	1969		Rock Shelter II, 3200 m—Gotiora, 3280 m—Gadje, 3950 m
	26			Gadje, 3950 m—Surjakund, 4400 m—Gosainkund, 4260 m
	27			Gosainkund, 4260 m
	28			Gosainkund, 4260 m—Surjakund, 4450 m—Gadje, 3950 m—Gotiora, 3280 m—Thale Patil, 3500 m
	29			Thale Patil, 3500 m—Mane, 3550 m—Hile Dhap, 3340 m—Dobate, 3230 m—Mangen Bhanjyang, 3160 m—Mere Danda, 3200 m—Panghu Danda, 3120 m—Tsedang Pokhari, 3000 m—Kutumsang, 2400 m
	30			Kutumsang, 2400 m—Thodang Danda, 2470 m—Duche Gyang, 2250 m—Gul Bhanjyang, 2100 m—Ingyur, 2240 m—Latsu, 2440 m—Chipling, 2160 m — Tanguni, 1840 m — Pati Bhanjyang, 1750 m
	31			Pati Bhanjyang, 1750 m—Bhorlang, 2370 m—Chipu Danda, 2390 m—Mul Kharka, 1850 m—Sundarijar, 1380 m—Kathmandu
October	2		*K*	Nagarjun, 1500 m
	21		*K*	Doralghat, 1000 m
November	1		*K*	Godawari, 1500 m
	8		*K*	Phulchoki, 2700 m
December	16		*K*	Kakani, Kathmandu, 2200 m
	30		*K*	Bagdwar, 2500 m
	31			Bagdwar, 2500 m—Budhanilkantha, 1500 m
January	6	1970	*K*	Trisuli, 500 m—Kagne, 700 m
	7			Kagne, 700 m—Samari Bhanjyang, 1200 m—Bhuktani, 1300 m
	8			Bhuktani, 1300 m—Hulkigaon, 1200 m—Chaurangi Phedi, 500 m—Gairi, 550 m—Achne, 500 m—Sukaura, 500 m
	9			Sukaura, 500 m—Arughat Bazar, 450 m—Majenda, 600 m
	10			Majenda, 600 m—Kanzo, 900 m—Sangu, 400 m
	11			Sangu, 400 m—Koprang, 600 m—Luitel, 500 m
	12			Luitel, 500 m—Sati Pokhari, 500 m—Chepey Tar Bridge, 370 m—Tarpu Ghat, 400 m—Tarku, 500 m
	13			Tarku, 500 m—Kunchha, 730 m—Sisa Ghat, 300 m
	14			Sisa Ghat, 300 m—Deorali, 900 m—Satmuhne, 500 m
	15			Satmuhne, 500 m—Pokhara, 600 m
	31		*K*	Balaju, Kathmandu, 1300 m
Feburary	4		*K*	Sheopuri, Kathmandu, 2700 m
	7		*K*	Shanku, Kathmandu, 1500 m
	10		*K*	Tikabhairab, 1500 m

March	1 1970	*K*	Daman, 2500 m
	6	*K*	Gokarna, 1200 m
	11	*K*	Doralghat, 1000 m—Bumro, 1900 m
	12		Bumro, 1900 m—Risanku, 1800 m
	13		Risanku, 1800 m—Tandj, 1900 m—Nigale, 2500 m
	14		Nigale, 2500 m—Rol Khane, 2500 m
	15–16		Rol Khane, 2500 m
	17		Rol Khane, 2500 m—Barabise, 800 m
April	4	*K*	Phulchoki, 2700 m
	15	*K*	Barabise, 800 m—Barati, 1300 m
	16		Barati, 1300 m—Thale Bisauna, 2800 m
	17		Thale Bisauna, 2800 m—Tingoang, 3200 m
	18		Tingoang, 3200 m—Harjung, 1700 m
	19		Harjung, 1700 m—Barabise, 800 m
	24–30	*KS*	Nagarjun, 2100 m
May	1	*K*	Barabise, 800 m—Jarjare, 2000 m
	2		Jarjare, 2000 m—Roll, 2900 m
	3		Roll, 2900 m—Jarjare, 2000 m
	4		Jarjare, 2000 m—Barabise, 800 m
June	23	*KS*	Bainse, 600 m—Mane Gaon, 1200 m
	24		Mane Gaon, 1200 m—Thale, 1900 m
	25		Thale, 1900 m—Dunche, 2000 m
	26		Dunche, 2000 m—Shyaprubensi, 1500 m
	27		Shyaprubensi, 1500 m—Tangjet, 1800 m
	28		Tangjet, 1800 m—Chilime, 1900 m—Khirojet, 2300 m
	29		Khirojet, 2300 m—Yatumbal, 2700 m
	30		Yatumbal, 2700 m—Oo Kharka, 3400 m
July	1		Oo Kharka, 3400 m—Mul Kharka, 3900 m
	2–6		Mul Kharka, 3900 m
	7		Mul Kharka, 3900 m—Yatumbal, 2700 m
	8		Yatumbal, 2700 m — Para Gaon, 2200 m — Chilime, 1900 m—Tangjet, 1800 m
	9		Tangjet, 1800 m—Shyaprubensi, 1500 m
	10		Shyaprubensi, 1500 m—Khanging, 2400 m
	11		Khanging, 2400 m—Syerpagaon, 2600 m—Langtang Gorge, 2800 m
	12		Langtang Gorge, 2800 m—Langtang, 3400 m
	13		Langtang, 3400 m—Kyangjing, 3800 m
	14–15		Kyangjing, 3800 m
	16		Kyangjing, 3800 m — Langtang, 3400 m — Langtang Gorge, 2800 m
	17		Langtang Gorge, 2800 m—Syerpagaon, 2600 m
	18		Syerpagaon, 2600 m—Shyaprubensi, 1500 m
	19		Shyaprubensi, 1500 m—Dunche, 2000 m
	20		Dunche, 2000 m—Thale, 1900 m—Ramche, 1800 m
	21		Ramche, 1800 m—Trisuli, 500 m
	22		Trisuli, 500 m—Rani Pouwa, 2000 m
	23		Rani Pouwa, 2000 m—Kathmandu

August	31	1970	*KSh*	Dakchin Kali, Kathmandu, 1500 m
September	1			Dakchin Kali, 1500 m—Okhre Danra, 2000 m
	2			Okhre Danra, 2000 m — Kuli Khani, 1500 m — Deorali, 1900 m
	3			Deorali, 1900 m — Kuli Khani, 1500 m — Chitalang, 1700 m
	4			Chitalang, 1700 m—Chandragiri, 2200 m—Thankot, 1700 m
	9		*K*	Barabise, 800 m—Thale, 2000 m
	10			Thale, 2000 m—Thale Bisauna, 2800 m
	11			Thale Bisauna, 2800 m—Tingoang, 3200 m
	12			Tingoang, 3200 m—Khosori Khabre, 1500 m
	13			Khosori Khabre, 1500 m—Barabise, 800 m
	18		*K*	Phulchoki, 2700 m
	22		*AKSh*	Barabise, 800 m—Thale, 2000 m
	23			Thale, 2000 m—Jangdang Kharka, 3100 m
	24			Jangdang Kharka, 3100 m—Tingoang, 3200 m
	25			Tingoang, 3200 m—Sano Tingsang, 2800 m
	26			Sano Tingsang, 2800 m — Tingoang, 3200 m — Lukthang, 3200 m
	27			Lukthang, 3200 m — Mogarcheko Danda, 3400 m — Lukthang, 3200 m
	28			Lukthang, 3200 m — Kalingchok, 3600 m — Kuri, 3200 m
	29			Kuri, 3200 m—Charikot, 1900 m

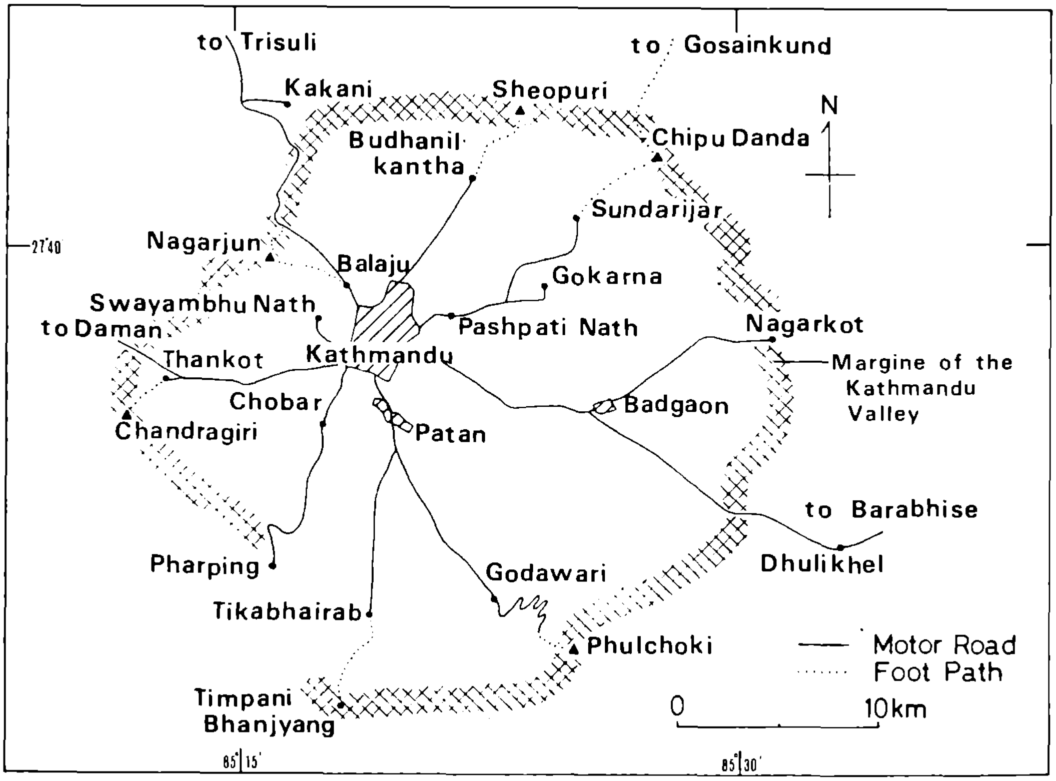

Fig. 5. Sketch map of the Kathmandu Valley.

September	30	1970	*AKSh*	Charikot, 1900 m — Mokaibari, 2000 m — Thunnai, 1900 m
October	1			Thunnai — Rol Khane 2500 m — Barabise 800 m
	18–21		*KS*	Phulchoki, 2700 m
	24		*K*	Nagarkot, Kathmandu, 2000 m
November	3–5		*KS*	Phulchoki, 2700 m
	12		*KS*	Kathmandu, 1300 m — Daman, 2500 m — Hetauda, 200 m
	13			Hetauda, 200 m — Patlaia, 200 m — Nijgar, 200 m — Sadaktor, 200 m
	14			Sadaktor, 200 m—Bagdeo, 300 m
	15			Bagdeo, 300 m—Patlaia, 200 m—Hetauda, 200 m—Gairigaon, 400 m
	16			Gairigaon, 400 m—Makwampur Garhi, 1100 m—Dunge Garhi, 700 m—Gairigaon, 400 m
	17			Gairigaon, 400 m—Hetauda, 200 m
	18			Hetauda, 200 m—Lothar, 200 m
	19			Lothar, 200 m—Narajani Ghat, 200 m
	20			Narajani Ghat, 200 m—Hetauda, 200 m—Daman, 2500 m—Kathmandu, 1300 m

SYSTEMATIC ENUMERATION OF THE PLANTS COLLECTED

The present enumeration of our collections comprises Spermatophyta, Pteridophyta and Bryophyta. The families in each of the phyla are arranged in the sequence presented in the preceding reports. Genera, species, and infraspecific taxa are arranged in alphabetical order. The names of investigators are given in parentheses at the beginning of each family or phylum.

In many families, species included in the previous reports were excluded from this enumeration to avoid duplication, except when corrections or additions to those species became necessary. Style and abbreviations are the same as in the previous volumes. The collector's names can be ascertained from our itineraries on pages 1–11. The areas of distribution are usually arranged from west to east as before. To save a space, the distribution of species is omitted when it is the same as the preceding reports.

The specimens enumerated are mostly kept in the Herbarium, Department of Botany, Faculty of Science and University Museum, University of Tokyo (TI), unless otherwise stated. Abbreviations of the herbarium names are those of the Index Herbariorum, Part 1, ed. 5 (1964).

SPERMATOPHYTA

ANGIOSPERMAE

DICOTYLEDONEAE—ARCHICHLAMYDEAE

SALICACEAE (by Arika Kimura)

Salix anticecrenata Kimura, sp. nov. [Plate 8]

Fruticulus nanus ut videtur solo vel rupestribus adpressus, foliis annotinis emortuis persistentibus notatus, ramis procumbentibus radicantibus in siccitate cinereo-brunneis 2.5–4.0 mm crassis, ramulis prostratis glabris siccitate brunneis striatis interdum paulo nitentibus 1.5–4.0 cm longis 0.8–1.2 mm crassis, hornotinis novellis tantum parce adpresse pilosis. Folia condensata elliptica vel oblongo- vel obovato-elliptica rarius oblanceolato-oblonga, apice obtusa vel obtuse acuta, basi acuta ad obtusissima, margine antice vel supra medium distincte quandoque obscure glanduloso-crenato-serrulata ceterum integerrima, supra viridia nitentia *stomatifera* glabra vel ad costam impressam minute pilosa, subtus pallide viridia vel dilute glaucina vulgo secus costam prominentem adpresse sericea margine angustissime leviterque revoluto-marginata, 4.5×2.0, 6.0×3.0, 8.6×4.2, 9.8×4.8, 10.0×4.8, 11.5×4.6 mm etc. magna, 2.0–2.5-plo longiora quam latiora; nervis primariis arcuato-ascendentibus supra tenuiter impressis utroque latere 3–5 a costa sub angulis 30°–50° divergentibus. *Folia annotina* emortua brunnea crasse chartacea vegetationis tempore in ramulis remanentia ut in *Salice rotundifolia* Trautv. etc. Petioli semiteretes supra tenuiter canaliculati sericei, subtus primo laxe sericei dein glabrescentes 2–4 mm longi. Stipulae minimae ovatae apice obtusissimae quasi glandiformes circ. 0.25 mm longae. Amenta ♀ coaetanea aut serotina ovato-capituliformia perparva 6–8-flora, sub anthesi 3.5–4.0 mm longa 2.5–3.0 mm crassa, ramulos breves parce pilosos 2.5–5.0 mm longos folia 4–7 gerentes terminantia, rhachidibus pilosis. Fl. ♀: bracteolae flores fere toto tegentes membranaceae concolores 3-nervatae, late oblongae vel elliptico-oblongae apice truncato-rotundatae aut emarginatae aut irregulatim undulatae vel sinuatae, extus convexae intus concavae utrinque glabrae, antice minute parce ciliatae, 2.2–2.6 mm longae, expansione 1.3 mm latae. Glandula una ventralis in sicco fuscescens ovato-rectangularis apice truncata paulum obcompressa circ. 1.0 mm longa 0.4–0.6 mm lata. Ovaria glaberrima anguste ovato-conica sub anthesi 1.3–1.5 mm longa circ. 0.8 mm lata, apice obtusissima basi brevissime stipitata, stipitibus 0.2–0.25 mm longis. Styli brevissimi 0.15–0.2 mm longi. Stigmata carinalia divaricata oblonga bifida 0.25–0.3 mm longa. Ovula in quaque placenta 3. Amenta fructifera circ. 7 mm longa 6 mm crassa; capsulae castaneae paulo nitentes ex ovata basi attenuato-conicae 3.0–3.6 mm longae 1.4–1.7 mm crassae, stipitibus 0.5–0.7 mm longis. Amenta ♂ capituliformia, ut ♀ ramulos breves paucifoliatos terminantia, circ. 5–7-flora, sub anthesi circ. 5–6 mm longa 3.0–5.0 mm crassa, rhachidibus pilosis. Fl. ♂: bracteolae fere ut in ♀, ad 2.7 mm longae, expansione 1.8–2.0 mm latae. Glandulae 2 ventralis et dorsalis ima basi leviter raro vix connatae in sicco fuscescentes (in vivo fusco-rubrae?); ventralis rectangularis truncata paulum obcompressa circ. 1.0 mm longa 0.6–0.7 mm lata; dorsalis ventrali conformis 0.9 mm longa 0.6 mm lata. Stamina 2, filamentis liberis glaberrimis aequilongis 2.0–2.5 mm vel ultra longis 0.25–0.3 mm crassis, bracteolam subaequantibus vel paulo superantibus. Antherae late orbiculares 0.8 mm longae 0.9 mm latae, in vivo obscure rubrae (ex collectoribus) siccitate fuscescentes.

NEPAL. Topke Gola, 3800 m (H. Kanai, H. Ohashi, K. Iwatsuki, H. Ohba, Z. Iwatsuki & P. R. Shakya ♀, Jun. 17, 1972, no. 727278. Holotypus in TI); Banduke Pokhari (Duo Tulo Pokhari)–Saju Pokhari, 4200–4000 m (H. Kanai, H. Ohashi, K. Iwatsuki, H. Ohba, Z. Iwatsuki & P. R. Shakya ♂, Jun. 15, 1972, no. 720504. Allotypus in TI, "Prostrate shrub, 3 cm high. Male stock. Anthers dark red. Pollen yellow").

Distr. E. Himalaya (E. Nepal).

A *Salice ovatomicrophylla* Hao quodammodo affini foliis plerisque majoribus antice crenato-serrulatis et praesertim annotinis emortuis diuturne in ramulis remanentibus distincta; etiam a *S. crenata* ejusdem auctoris discrepans foliis antice solum crenato-serrulatis, annotinis emortuis remanentibus, bracteolis filamentis tantum paulo brevioribus nec "about 1/2 as long as the stamen" (ex Hao) et glandula ventrali non "cylindrical" (ex Hao). Est certe e sect. Lindleyanarum[1].

mstr[2]. **monadelpha** Kimura, mstr. nov. [Plate 2c]

Filamentis alte vel toto ad apicem usque connatis dignoscitur.—Filamenta glabra 2.4–4.0 mm longa e basi fere ad 3/4 totae longitudinis vel prorsus ad apicem usque connata; ceterum ut in typica.

NEPAL. Banduke Pokhari (Duo Tulo Pokhari) – Saju Pokhari, 4200-4000 m (H. Kanai, H. Ohashi, K. Iwatsuki, H. Ohba, Z. Iwatsuki & P. R. Shakya ♂, Jun. 15, 1972, no. 720504 pro parte[3]. Typus mstr. in TI).

Distr. E. Himalaya (E. Nepal).

Salix hylematica Schneider: Kimura in Fl. E. Himal. **2**: 15 (1971).

NEPAL. Oo Kharka-Mul Kharka, 3400–3800 m (Jul. 1, 1970, no. 672177).

Examinavi etiam multa specimina hujus salicis ex Nepalia a Herb. Musei Britannici nobiscum communicata; folia eorum supra non stomatifera.

Salix Lindleyana Wallich ex Andersson in Svensk. Vetensk. Akad. Handl. **1850**: 499 (1851); in Journ. Linn. Soc. **4**: 56 (1860); in DC., Prodr. **16** (2): 296 (1868)–Brandis, Forest Fl. N.-W. & C. Ind. 471 (1874); Ind. Trees 638 (1906)–Hook. f., Fl. Brit. Ind. **5**: 634 (1888)–Schneider in Pl. Wilson. **3**: 145 (1916)–Görz in Journ. Arnold Arb. **13**: 394 (1932)–Hao in Fedde, Rep. Beih. **93**: 51 (1936).

Salix Souliei Seemen in Fedde, Rep. **3**: 23 (1906)–Schneider in Pl. Wilson. **3**: 62 (1916), fide Görz.

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1) Ad diagnosin sectionis a C. K. Schneider datam adde: — Antherae interdum purpureae.

2) Monstrositas sive forma monstrosa.

3) Specimen hoc et allotypicum sub eodem numero mihi sunt communicata, quidque tamen ut opinor certe ex individuo haud eodem sed alieno collectum.

var. **microphylla** Andersson in Svensk. Vetensk. Akad. Handl. **1850**: 500 (1851); in DC., Prodr. **16** (2): 296 (1868).

NEPAL. Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972, ♂ & ♀ ovariis glaberrimis); Jalang Chhyongo–Janga La–Thudam, 3400–4600 m (Jun. 21, 1972, no. 720652 ♂, "Prostrate shrub, 3 cm high. Male stock. Bracts glaucous. Glands 2, black purple. Stamens 2. Filaments free from the base, glabrous" & ♀ ovariis glaberrimis).

f. **hebecarpa** Kimura, f. nov.

A typica ovariis adpresse sericeis recedit.—Amenta ovato-capituliformia perparva circ. 3–5 mm longa 2–3.8 mm crassa, 2–5-flora, ramulos breves 2–6 mm longos folia 4–5 raro 7 gerentes terminantia. Bracteolae luteolae, sub anthesi apicem ovarii attingentes, obovatae apice rotundatae basi subcuneatae 2.3–2.7 mm longae circ. 1.3 mm latae, in expansione late ovales tum 1.6–2.0 mm latae, extus convexae glabrae vel parte mediana longitudinaliter pilis minutis adpressis conspersae, intus valde concavae glabrae, margine pilis minutis curvis vel crispulis parce ciliatae. Glandula una ventralis lutea crassa ovato-oblonga vel oblonga apice obtusissima vel truncata 1.0–1.3 mm longa 0.4–0.6 mm lata. Ovaria ovato-oblonga sursum attenuata apice obtusissima 1.8–2.5 mm longa 0.8–1.0 mm lata, sub microscopio latere ventrali et dorsali (partibus apicalibus basalibus et secus lineam suturalem exceptis) pilis brevibus adpressis albo-sericea, stipitibus glabris vix 0.2 mm longis; stylis 0.25–0.5 mm longis, profunde vel fere ad basin usque divisis. Stigmata oblonga vel cuneato-oblonga brevia excurva integra vel retusa ad 0.25 mm longa. Ovula in quaque placenta 3.

NEPAL. Topke Gola, 3800 m (H. Kanai, H. Ohashi, K. Iwatsuki, H. Ohba, Z. Iwatsuki & P. R. Shakya ♀, Jun. 8, 1972, no. 720579. Typus in TI. "Apressed shrub, 5 cm high. Ovaries apressed short hairy, whitish").

Distr. Himalaya (Kumaon, Nepal, Sikkim) and W. China (Yunnan).

Adnotatio: Folia perparva crassiuscula valde condensata lanceolato-oblonga vel oblanceolato-oblonga ad elliptica, apice obtusa basi acuta vel obtusa, margine integerrima anguste revoluta, supra laete viridia nitentia *non stomatifera* glabra vel parce minuteque crispo-pilosa, costa mediana impressa, subtus glauca costa mediana prominente adpresse albo-pilosa vel sericea excepta glabra vel undique laxe sericea, 4.0–7.0 mm longa 2.0–2.7 mm lata, 1.8–3.2-plo longiora quam latiora; petiolis semiteretibus supra glabris tenuiter canaliculatis 1.0–2.0 mm longis, subtus glabris vel parce adpresse pilosis.—Descriptionem feci ad n. 720579.

Salix ovatomicrophylla Hao in Fedde, Rep. Beih. **93**: 53 (1936), anglice cum icon. photo. (Pl. 8, fig. 15): Kimura in Fl. E. Himal. 44 (1966).

NEPAL. Mul Kharka, Chilime Khola, 4000–4100 m (H. Kanai & P. R. Shakya Jul. 3, 1970, no. 672267 ♂, sub anth. "Male stock: Bracts reddish. Stamens 2, twice as long as bract. Glands 2, yellowish, rod-shaped, at the base of stamen"; Jul. 3, 1970, no. 672258 ♀, sub anth. "Female stock: Bracts reddish, as long as ovary. Style 0. Stigma small. Glands 2, yellowish, 1/3 as long as ovary").

Distr. E. Himalaya (Nepal, Sikkim) and W. China (Yunnan).

Folia supra *stomatifera*.—Vidi specimen n. 10388 ♀ a J. F. Rock a. 1921 in Yunnan lectum (Eastern slopes of Mount Dyinaloko, northern peak of the Likiang Snow Range. On limestone boulders, alpine region, 15000 ft.) in Herb. Arboreti

Arnoldiani conservatum, quod Hao ill. in opere suo supra citato ad hanc speciem refert. Specimen nostrum ♀ cum eo Rockii bene congruit; ♂ autem filamentis staminum inferne parce pilosis (nec "glabrous"), antheris in sicco atropurpureis (nec "yellow") cum descriptione originali non plene conveniens sed forsan ut mihi quidem videtur ad hanc speciem referendum.

FAGACEAE (by Hiroo Kanai)

Castanopsis indica (Roxb.) A. DC.: Kanai in Fl. E. Himal. 49 (1966).

NEPAL. Makwampur, 600 m (Apr. 20, 1969); Sundarijar, 1400 m (Aug. 31, 1969); Tarku–Sisa Ghat, 600 m (Jan. 13, 1970); Khosori Khabre-Barabise, 1000 m (Sep. 13, 1970); Saju Khola–Dingla, 1200 m (Jul. 1, 1972).

Castanopsis tribuloides (Smith) A. DC.: Fl. E. Himal. 49 (1966).

NEPAL. Sundarijar, 1600 m (Feb. 13, 1969); Dhara Pani–Makwampur Garhi, 900 m (Apr. 21, 1969); Makwampur Garhi, 1000 m (Apr. 22, 1969); Phulchoki, 1700 m (Aug. 9, 1969); Gokarna, 1300 m (Mar. 6, 1970); Deorali–Chitlang, 1900 m (Sep. 3, 1970); Makwampur Garhi–Dunge Garhi, 700 m (Nov. 16, 1970); Papung, 2000 m (Jun. 29, 1972); Bir Gaon, 1600 m (Jun. 30, 1972); Papung–Bir Gaon, 1900 m (Jun. 30, 1972).

Lithocarpus grandifolia (D. Don) S. N. Biswas: Kanai in Fl. E. Himal. **2**: 18 (1971).

NEPAL. Kakani, 2200 m (Dec. 16, 1969).

DARJEELING. Batasi–Mani Bhanjyang, 2000 m (Aug. 9, 1972).

Quercus acutissima Carruth: Fl. E. Himal. 50 (1966).

NEPAL. Nagarkot, 2000 m (Nov. 24, 1970).

Quercus glauca Thunb.: Fl. E. Himal. 50 (1966).

NEPAL. Sundarijar, 1600 m (Feb. 13, 1969); Phulchoki, 1800 m (Apr. 11, 1969); Makwampur Garhi–Dunge Garhi, 1000 m (Apr. 22, 1969); Nagarjun, 1600 m (Apr. 29, 1970).

Quercus lanuginosa D. Don, Prodr. Fl. Nepal. 57 (1825)-Hook. f., Fl. Brit. Ind. **5**: 603 (1888).

Q. incana Roxb. sensu Kanai in Fl. E. Himal. 50 (1966).

NEPAL. Sundarijar, 1600 m (Feb. 13, 1969); Phulchoki, 2200 m (Apr. 11, 1969).

ULMACEAE (by Hiroo Kanai)

Holoptelea integrifolia Planch. in Ann. Sci. Nat. ser. 3, **10**: 269 (1848)-Hook. f., Fl. Brit. Ind. **5**: 481 (1888).

NEPAL. Tamur Bridge–Teku Nala, 500 m (Jun. 3 & Jul. 9, 1972).

Distr. Himalaya, India, Ceylon, Burma, and Indo-China.

URTICACEAE (by Hiroshi Hara)

Boehmeria clidemioides Miquel, Pl. Jungh. 34 (1851)-Hand.-Mzt., Symb. Sin. **7**: 152 (1929).

Urtica cinerascens Wallich, Cat. no. 4591 (1831), nom. nud.

U. comosa Hamilt. ex Wallich, Cat. no. 4616E (1831), nom. nud.

B. sidaefolia Wedd. in Ann. Sci. Nat. ser. 4, **1**: 203 (1854)-Tuyama in Fl. E. Himal. 57 (1966).

B. diffusa Wedd., Monogr. Urtic. 356 (1856).

Boehmeria platyphylla var. *clidemioides* (Miq.) Wedd., l. c. 366 (1856), quoad basionym.

B. comosa Wedd. in DC., Prodr. **16** (1): 205 (1869).

B. platyphylla var. *cinerascens* Hook. f., Fl. Brit. Ind. **5**: 579 (1888).

B. clidemioides var. *diffusa* (Wedd.) Hand.-Mzt., l. c. 152 (1929).

Distr. E. Himalaya (Nepal to Bhutan), Assam, N. Burma, Indo-China, W. China, and Malaysia.

Boehmeria macrophylla D. Don: Fl. E. Himal. 56 (1966).

BHUTAN. Nyotoka–Samtengang, 1500–2100 m (Apr. 10, 1967, fr.).

Distr. Himalaya (Garhwal to Bhutan), Assam, Burma, Indo-China, and W. China.

Boehmeria platyphylla D. Don: Fl. E. Himal. 56 (1966).

Urtica scabrella Roxb. [Hort. Beng. 67 (1814), nom. nud.–Wallich, Cat. no. 4581 (1831), nom. nud.] Fl. Ind. ed. 2, **3**: 581 (1832).

B. rotundifolia Hamilt. ex D. Don, Prodr. Fl. Nepal. 60 (1825), e typo.

B. scabrella Gaud. [Voy. Freyc. Bot. 500 (1830), nom. nud.] ex Miq., Fl. Ind. Bat. **1** (2): 252 (1859), p.p.

U. macrostachya Wallich, Cat. no. 4582A–C (1831), nom. nud.

Splitgerbera macrostachya Wight, Icon. **6**: 10, t. 1977 (1853).

B. macrostachya Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 199 (1854), nom. nud.] ex Blume, Mus. Bot. Lugd.-Bat. **2**: 224 (1857).

B. platyphylla var. *macrostachya* (Wight) Wedd., Monogr. Urtic. 367 (1856).

B. platyphylla var. *scabrella* Wedd., l.c. 365 (1856)–Fl. Brit. Ind. **5**: 578 (1888).

B. cuspidata Blume, Mus. Bot. Lugd.-Bat. **2**: 216 (1857).

B. platyphylla var. *rotundifolia* (Hamilt. ex D. Don) Wedd. in DC., Prodr. **16** (1): 212 (1869), p.p.–Fl. Brit. Ind. **5**: 579 (1888), p.p.

var. **canescens** (Wedd. ex Bl.) Wedd. in DC., Prodr. **16**(1): 213 (1869), excl. *B. ternifolia*–Fl. Brit. Ind. **5**: 579 (1888), p.p.

Urtica macrostachya var. *canescens* Wallich, Cat. no. 4582D (1831), nom. nud.

Boehmeria canescens Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 200 (1854), nom. nud.] ex Blume, Mus. Bot. Lugd.-Bat. **2**: 224 (1857).

B. platyphylla var. *cuspidata* Wedd. subvar. *canescens* Wedd., Monogr. Urtic. 365 (1856), excl. *B. ternifolia.*

NEPAL. Godawari, Kathmandu, 1500 m (Sep. 18, 1963, fl.); Iladanda–Selap, 1800–2600 m (Nov. 9, 1963, fr.); Ghatte–Khebang, 2400–1700 m (Nov. 19, 1963, fr.).

Distr. E. Himalaya and ?W. China.

Boehmeria polystachya Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 200 (1854), nom. nud.] Monogr. Urtic. 370 (1856): Fl. E. Himal. 56 (1966).

NEPAL. Tingoang–Khosori Khabre (Sep. 12, 1970, fr.).

DARJEELING. Phalut–Ratho Chu, 2800 m (Aug. 4, 1972, fl).

Distr. Himalaya (Kumaon to Bhutan), Assam, and W. China.

Boehmeria rugulosa Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 200 (1854), nom. nud.] Monogr. Urtic. 378 (1856): Fl. E. Himal. 57 (1966).

BHUTAN. Near Lunten Zampa, 1200 m (Nishioka, Nov. 24, 1965).

Distr. Himalaya (Punjab to Bhutan) and ?Burma.

Boehmeria ternifolia D. Don: Fl. E. Himal. 57 1966), excl. syn.

Urtica caudigera Wallich, Cat. no. 4585 (1831), nom. nud.

B. caudigera Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 199 (1854), nom. nud.] ex Blume, Mus. Bot. Lugd.-Bat. **2**: 219 (1857).

B. platyphylla D. Don var. *cuspidata* Wedd., Monogr. Urtic. 364 (1856), excl. *B. rotundifolia.*

U. blanda Wall. ex Wedd., l.c. 365 (1856), pro syn.

B. platyphylla var. *rotundifolia* Wedd. in DC., Prodr. **16** (1): 212 (1869), p.p., excl. basionym–Fl. Brit. Ind. **5**: 579 (1888), p.p.

B. cuspidata C. B. Clarke in Journ. Linn. Soc. **15**: 124 (1876).

NEPAL. Papung–Bir Gaon, 1900 m (Jun. 30, 1972); Bir Gaon–Dingla, 1600–1000 m (Jul. 1, 1972).

BHUTAN. Tashi Choling–Kyebaka, 2100–1600 m (Apr. 26, 1967); Tinlegang, 1950 m (May 3, 1967); Bhotakha–Rinchu, 1450–1500 m (May 8, 1967, fl.).

Distr. Himalaya (Punjab to Bhutan).

Chamabainia cuspidata Wight: Fl. E. Himal. 57 (1966).

NEPAL. Hile–Chitre, 1900–2400 m (Jun. 5, 1972); Shewaden–Mewa Khola, 2400 m (Jun. 29, 1972, fl.).

DARJEELING. 2250 m (Jun. 23, 1969; Jul. 25, 1972, fl.); Senchal–Ghum, 2400–2300 m (Jul. 6, 1969, fl.).

BHUTAN. Pasikha, 1900 m (Apr. 4, 1967).

Distr. Himalaya (Garhwal to Bhutan), Khasia, India, Ceylon, Indo-China, W. China, Formosa, and ?Java.

Debregeasia longifolia (Burm. f.) Wedd.: Fl. E. Himal. 57 (1966).

BHUTAN. Tashiling–Tongsa Bridge, 2300–1900 m (Apr. 16, 1967).

Distr. Himalaya (Kumaon to NEFA), India, Burma, Indo-China, W. & C. China, and Malaysia.

Debregeasia salicifolia (D. Don) Rendle in Prain, Fl. Trop. Afr. **6** (2): 295 (1917).

Boehmeria salicifolia D. Don, Prodr. Fl. Nepal. 60 (1825), e typo.

Urtica bicolor Wall. [Cat. no. 4613 (1831), nom. nud.] ex Roxb., Fl. Ind. ed. 2, **3**: 589 (1832).

B. hypoleuca Hochst. in A. Rich., Tent. Fl. Abyss. **2**: 264 (1851).

Morocarpus salicifolius (D. Don) Blume, Mus. Bot. Lugd.-Bat. **2**: 157 (1856).

D. hypoleuca (Hochst.) Wedd., Monogr. Urtic. 463, t. 15A, f. 10 & 11 (1857)–Fl. Brit. Ind. **5**: 591 (1888).

NEPAL. Chilime–Para Gaon, 2200 m (Jun. 28, 1970, fr.).

Distr. Arabia, Afghanistan, and Himalaya (Kashmir to Nepal).

Debregeasia Wallichiana Wedd.: Hara, Fl. E. Himal. **2**: 20 (1971).

NEPAL. Dingla–Doban, 900 m (Jul. 2, 1972, fr.).

Distr. Himalaya (Nepal, Sikkim), Khasia, Burma, and Indo-China.

Dendrocnide sinuata (Blume) Chew in Gard. Bull. **21**: 206 (1965); l.c. **25**: 36, f. 13 & 14 (1969).

Urtica sinuata Blume, Bijdr. 505 (1826).

U. crenulata Roxb., Fl. Ind. ed. 2, **3**: 591 (1832), non Sev. (1785).

Laportea crenulata Wedd., Monogr. Urtic. 133 (1856)–Fl. Brit. Ind. **5**: 550 (1888).

L. sinuata (Blume) Miquel, Ann. Mus. Bot. Lugd.-Bat. **4**: 301 (1869).

BHUTAN. Phuntsholing, 300–900 m (Apr. 3, 1967, bud).

Distr. E. Himalaya (Nepal to Bhutan), India, Ceylon, Burma, Thailand, Indo-China, China, and Malaysia.

Elatostema dissectum Wedd., Monogr. Urtic. 314 (1856)–Fl. Brit. Ind. **5**: 568 (1888)–Hand.-Mzt., Symb. Sin. **7**: 145 (1929).

Pellionia heteroloba Wedd. sensu Tuyama in Fl. E. Himal. 60 (1966).

DARJEELING. Takdah, 1600–1700 m (Apr. 19, 1960, ♂ fl.).

BHUTAN. Rinchu–Mishichen, 1500–1600 m (May 9, 1967, ♂ fl.).

Distr. E. Himalaya (E. Nepal to Bhutan), Khasia, N. Burma, and W. China.

Elatostema ficoides Wedd., Monogr. Urtic. 306, t. 10 (1856)–Fl. Brit. Ind. **5**: 563 (1888).

Procris ficoidea Wall., Cat. no. 4635 (1831), nom. nud.

DARJEELING. Ubayuri-dani, 2250 m (Jun. 23, 1969, bud).

Distr. Himalaya (Punjab to Sikkim), Khasia, and W. China.

Elatostema Hookerianum Wedd.: Fl. E. Himal. 58 (1966).

BHUTAN. Phuntsholing–Chimakhothi, 300–2350 m (Apr. 4, 1967, ♂ fl.); Neylong–Tashiling, 2400–2300 m (Apr. 15, 1967, ♂ fl.).

Distr. E. Himalaya (Sikkim to NEFA), S. Tibet, Khasia, and Naga Hills.

Elatostema integrifolium (D. Don) Wedd. in DC., Prodr. **16** (1): 179 (1869)–Backer et Bakh.-Brink, Fl. Jav. **2**: 43 (1965).

Procris integrifolia D. Don, Prodr. Fl. Nepal. 61 (1825).

P. sesquifolia Reinw. ex Blume, Bijdr. 511 (1826).

P. punctata Ham. ex Wall., Cat. no. 4627 (1831), nom. nud., p.p.

P. piperifolia Wall., Cat. no. 4628 (1831), nom. nud.

E. sesquifolium (Bl.) Hassk., Cat. Hort. Bogor. 79 (1844)–Wedd., Monogr. Urtic. 308 (1856)–Fl. Brit. Ind. **5**: 564 (1888), p.p.

E. sesquifolium α. integrifolium (D. Don) Wedd., l.c. 308 (1856).

E. sesquifolium β. semiserratum Wedd., l.c. 308 (1856), p.p.

E. integrifolium var. *semiserrata* Wedd. in DC., Prodr. **16** (1): 180 (1869), p.p.

E. lineolatum Wight var. *integrifolia* Hook. f., Fl. Brit. Ind. **5**: 565 (1888), p.p.

NEPAL. Phulchoki, Kathmandu, 2200–2700 m (Jul. 15, 1972, no. 723918, fl.).

Distr. Himalaya (Kumaon to Bhutan), Khasia, India, Burma, and Malaysia.

Typical *Elatostema integrifolium* from E. Himalaya tends to have leaves with a few coarse teeth approaching to *E. lineolatum* var. *majus*, and seems to be somewhat different from *E. sesquifolium* of Java. The specimen from Kumaon (T. Thomson, Jun. 1845, no. 1191, BM) cited under *E. sesquifolium* var. *semiserratum* Wedd. is the same as typical *E. integrifolium*.

Elatostema lineolatum Wight: Fl. E. Himal. 58 (1966).

BHUTAN. Phuntsholing, 900 m (Apr. 3, 1967, fl.).

Distr. Himalaya (Kumaon to Bhutan), Khasia, India, Ceylon, and Burma.

var. **majus** Wedd.,1) Monogr. Urtic. 312 (1856); in DC., Prodr. **16** (1): 182

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1) Lectotype of *E. lineolatum* var. *majus* : Malabar, Concan, trop. (Stocks in BM).

(1869)-Fl. Brit. Ind. **5**: 565 (1888), p.p., ut var. *major* Thwaites.
E. sesquifolium β. semiserratum Wedd., l.c. 308 (1856), p.p.
E. integrifolium var. *semiserrata* (Wedd.) Wedd., l.c. 180 (1869), p.p.
E. lineolatum var. *integrifolia* Hook. f., Fl. Brit. Ind. **5**: 565 (1888), p.p.

DARJEELING. Darjeeling-Tista, 2000–1000 m (Jun. 8, 1967, fl.).

BHUTAN. Mishichen-Khosa, 1600–1800 m (May 10, 1967, fl.); Khosa-Tamji, 1800–2200 m (May 11, 1967).

Distr. Himalaya (Nepal to Bhutan), Khasia, India, and Ceylon.

Elatostema monandrum (Hamilt. ex D. Don) Hara, comb. nov.
Procris monandra Hamilt. ex D. Don, Prodr. Fl. Nepal. 61 (1825), e typo.
P. diversifolia Wall., Cat. no. 4631 (1831), nom. nud.
P. elegans Wall., Cat. no. 4632 (1831), nom. nud.
E. surculosum Wight (1853): Fl. E. Himal. 59 (1966), p.p.
E. diversifolium Wedd. in DC., Prodr. **16** (1): 189 (1869).
E. surculosum var. *elegans* Hook. f., Fl. Brit. Ind. **5**: 573 (1888).

NEPAL. Godawari-Phulchoki, 2500–3000 m (Jun. 23 & 26, 1967; Jun. 10, 1969); Chitre-Dor, 2300–2600 m (Jun. 6, 1972); Chauke-Lamo Pokhari, 2600–2900 m (Jun. 8, 1972); Shewaden-Mewa Khola, 2500 m (Jun. 29, 1972, fl.); Chauke-Dor, 2600–2900 m (Jul. 6, 1972, fl.); Gram-Dunche, 1900–2000 m (Aug. 21, 1972, fr.); Khodang Danda-Latsu, 2500–2100 m (Aug. 29, 1972, fl.).

DARJEELING. 2250 m (Jun. 23, 1969, fl.); Phalut-Raman, 3000–2100 m (Aug. 4, 1972, fl.).

SIKKIM. Damthang-Tendong, 2150–2900 m (Jun. 29, 1969, fl.).

BHUTAN. Bhotokha-Rinchu, 1450–1500 m (May 8, 1967); Thimphu-Chimakhothi, 2450–2350 m (Jun. 1, 1967).

Distr. Himalaya (Simla to Bhutan), India, Ceylon, Indo-China, and W. China.

The species is variable in the length and hairiness of stems, the size, shape and hairiness of leaves, and the length of peduncles. Hooker f. has separated several varieties based on these characters, and some of our specimens are referrable to f. *ciliatum*, f. *pedunculosum*, f. *pinnatifidum*, and f. *subincisum*[1].

Elatostema nasutum Hook. f., Fl. Brit. Ind. **5**: 571 (1888).
E. nigrescens Miq. sensu Clarke in Journ. Linn. Soc. **15**: 124 (1877).

DARJEELING. Raman-Rimbick, 1900–2400 m (Aug. 5, 1972, fl.).

Distr. Sikkim.

Elatostema obtusum Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 190 (1854), nom. nud.] Monogr. Urtic. 324 (1856): Fl. E. Himal. 58 (1966).

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[1] **Elatostema monandrum** (Hamilt. ex D. Don) Hara
f. **ciliatum** (Hook. f.) Hara, stat. nov.
E. surculosum var. *ciliata* Hook. f., Fl. Brit. Ind. **5**: 573 (1888).
f. **pedunculosum** (Hook. f.) Hara, stat. nov.
E. surculosum var. *pedunculosa* Hook. f., l.c. 573 (1888).
f. **pinnatifidum** (Hook. f.) Hara, stat. nov.
E. surculosum var. *pinnatifida* Hook. f., l.c. 573 (1888).
f. **subincisum** (Hook. f.) Hara, stat. nov.
E. surculosum var. *subincisa* Hook. f., l.c. 573 (1888).

NEPAL. Tangjet–Khirojet, 1750–2300 m (Jun. 28, 1970, no. 67, fl.); Sano Tingsang, 3200 m (Sep. 26, 1970, no. 674612, fr.); Lamo Pokhari, 2900 m (Jun. 9, 1972, no. 720276, fl.); Topke Gola–Shewaden, 3000 m (Jun. 28, 1972, fl.).

Distr. Himalaya (Kumaon to Bhutan), Khasia, Burma, and W. China.

Elatostema platyphyllum Wedd.: Fl. E. Himal. 58 (1966).

BHUTAN. Bhotokha–Rinchu, 1500 m (May 8, 1967, fr.); Rinchu–Mishichen, 1500–1600 m (May 9, 1967, fl.).

Distr. Himalaya (Kumaon to Bhutan), Khasia, Naga Hills, W. China, and Formosa.

var. **polycephalum** Hara, var. nov.

Receptacula parva breviter pedunculata nodo aggregata.

NEPAL. Illam–Ranga Pani, 1200–400 m (Dec. 8, 1963, no. 6307156, bud).

BHUTAN. Tinlegang–Gon Chungnang, 1800 m (May 5, 1967, bud); Bhotokha–Rinchu, 1500 m (May 8, 1967, no. 14522, fr. Holotype in TI).

Distr. var. Himalaya (Kumaon to Bhutan).

In the typical form, the receptacles are solitary or binate at a single node, while in var. *polycephalum* they are small and clustered at a node, and its leaves are extremely oblique at the base and generally longer-petiolate.

Elatostema pusillum C. B. Clarke ex Hook. f., Fl. Brit. Ind. **5**: 568 (1888).

NEPAL. Chauke–Dor, 2600–2900 m (Jul. 6, 1972, no. 726036, fl.).

DARJEELING. Palmajua, 2200 m (Aug. 2, 1972, fr.).

Distr. Himalaya (Simla to Sikkim).

Elatostema rupestre (D. Don) Wedd., Monogr. Urtic. 304 (1856); in DC., Prodr. **16**(1): 177 (1869)–Fl. Brit. Ind. **5**: 564 (1888).

Procris rupestris Hamilt. ex D. Don, Prodr. Fl. Nepal. 60 (1825).

NEPAL. Pokhara, 900 m (Jun. 8, 1967, fl., a glabrescent form); Chobar, Kathmandu, 1200 m (Jun. 17, 1967, fl.).

Distr. Himalaya (Kumaon, Nepal), Khasia, Burma, W. China, and Java.

Elatostema sessile J. R. et G. Forster: Fl. E. Himal. 59 (1966).

NEPAL. Phulchoki, Kathmandu, 2200–2900 m (Jun. 10, 1969; Jul. 15, 1972, fl.); Hile–Chitre, 1900–2400 m (Jun. 5, 1972); Shewaden–Mewa Khola, 2500 m (Jun. 29, 1972, fl.); Bhuje–Chauke, 2700–2900 m (Jul. 4, 1972, fl.).

Distr. Himalaya, India, Burma, W. & C. China, Formosa, and Malaysia.

var. **polycephalum** Wedd., Monogr. Urtic. 295 (1856), ut *β. polycephala*–Fl. Brit. Ind. **5**: 564 (1888)–Hand.-Mzt., Symb. Sin. **7**: 145 (1929).

Procris punctata Hamilt. ex D. Don, Prodr. Fl. Nepal. 61 (1825).

P. polycephala Wallich, Cat. no. 4629 (1831), nom. nud.

Elatostema punctatum (Hamilt.) Wedd. in Ann. Sci. Nat. ser. 4, **1**: 189 (1854), p.p., quoad basionym Hamilt.

E. polycephalum (Wedd.) Wedd., l.c. 189 (1854), nom. nud.

E. sessile β. punctatum (Hamilt. ex D. Don) Wedd. in DC., Prodr. **16** (1): 173 (1869).

NEPAL. Pokhara, 900 m (Jun. 18, 1967, bud).

Distr. Himalaya (Mussourie to Bhutan) and W. & C. China.

This variety has several small clustered short-peduncled receptacles at a node, and also the stems are generally very minutely papillose, and the leaves are auricled at the base.

Elatostema sikkimense C. B. Clarke in Journ. Linn. Soc. **15**: 125 (1876)–Fl. Brit. Ind. **5**: 571 (1888).

SIKKIM. Gangtok, 1650 m (Jun. 15, 1960, fl.); Singhik–Gangtok, 1500–1900 m (Jul. 1, 1969, fl.).

Distr. Sikkim.

Elatostema Stracheyanum Wedd. in Ann. Sci. Nat. ser. 4, **1**: 188 (1854); Monogr. Urtic. 328, t. 9, f. 18 (1856); in DC., Prodr. **16**(1): 189 (1869)–Fl. Brit. Ind. **5**: 567 (1888)–Schröter et Winkler in Fedde, Rep. Beih. **83** (2): 154 (1936).

NEPAL. Nagarjun, Kathmandu, 1500 m (Apr. 29, 1970).

BHUTAN. Ritang–Rukubi, 2600–2800 m (Apr. 13, 1967, bud).

Distr. Himalaya (Kumaon to Bhutan), Khasia, and W. China.

Elatostema subincisum Wedd., Monogr. Urtic. 314 (1856)–Fl. Brit. Ind. **5**: 566 (1888).

E. surculosum Wight sensu Tuyama in Fl. E. Himal. 59 (1966), p.p.

NEPAL. Bilbatay Bhanjyang–Hati Sar, 2200–2700 m (Oct. 27, 1963, no. 6307159); Hati Sar–Minchin Dhap, 2700–2900 m (Oct. 28, 1963); Minchin Dhap–Mul Pokhari, 2900–2500 m (Oct. 29, 1963); Baroya Khimty–Thakma Khola, 2500–3200 m (Nov. 12, 1963); Diorali Bhanjyang (Nov. 14, 1963).

DARJEELING. Gairibas–Tonglu, 2800–3000 m (Jun. 7, 1960); Senchel–Tiger Hill, 2400–2500 m (Jun. 23, 1960).

Distr. E. Himalaya (Nepal, Sikkim).

Oreocnide frutescens (Thunb.) Miquel, Ann. Mus. Bot. Lugd.-Bat. **3**: 131 (1867).

Urtica frutescens Thunberg, Fl. Jap. 70 (1784)–Roxb., Fl. Ind. ed. 2, **3**: 589 (1832).

Boehmeria frutescens (Thunb.) Thunb. in Trans. Linn. Soc. **2**: 330 (1794).

B. frondosa D. Don, Prodr. Fl. Nepal. 59 (1825).

B. fruticosa Gaud. in Voy. Bot. Freyc. 500 (1830).

Morocarpus microcephalus Benth. in Hook. Kew Journ. Bot. **6**: 78 (1854).

Villebrunea frutescens (Thunb.) Blume, Mus. Bot. Lugd.-Bat. **2**: 168 (1857)–Wedd., Monogr. Urtic. 455 (1857)–Koidzumi in Act. Phytotax. Geobot. **10**: 222 (1941): Fl. E. Himal. 62 (1966).

V. fruticosa (Gaud.) Nakai in Bot. Mag. Tokyo **41**: 514 (1927).

O. fruticosa (Gaud.) Hand.-Mzt., Symb. Sin. **7**: 154 (1929).

V. microcephala (Benth.) Nakai in Bot. Mag. Tokyo **55**: 559 (1941).

BHUTAN. Samtengang–Ritang, 2100–2600 m (Apr. 11, 1967, ♀ fl.); Tongsa–Tashiling, 2300–2300 m (Apr. 19, 1967, fl.); Ritang–Ratsoo, 2600–2000 m (Apr. 23, 1967); Tinlegang, 1950 m (May 4, 1967, ♀ fl.); Mishichen–Khosa, 1600–1800 m (May 10, 1967, ♀ fl.).

Distr. Himalaya (Punjab to Bhutan), Khasia, Burma, Indo-China, W. & S. China, and S. Japan.

Parietaria micrantha Ledeb., Icon. Pl. Alt. **1**: 7, t. 22 (1829); Fl. Alt. 303 (1833)–Komarov, Fl. USSR **5**: 402 (1936).

P. debilis Forst. f. *α. micrantha* (Ledeb.) Wedd. in DC., Prodr. **16**(1): 235^{45} (1869).

P. debilis Forst. f. sensu Hook. f., Fl. Brit. Ind. **5**: 593 (1888).

P. lusitanica L. subsp. *chersonensis* (Lang) Chrtek var. *micrantha* (Ledeb.) Chrtek in Folia Geobot. Phytotax. Praha **8**: 426 (1973).

NEPAL. Gopte–Thale Patil, 3400 m (Aug. 26, 1972, no. 721972, fr.).

Distr. S. Ural, Caucasus, Asia Minor, C. Asia, Himalaya, Siberia, Mongolia, China, and Japan.

The Himalayan plants agree well with the Japanese ones, and they are certainly identical with *Parietaria micrantha*. As compared with *P. debilis*, *P. micrantha* is much more delicate diffuse plants with thinner soft-hairy leaves. In these respects, it comes nearer to *P. lusitanica* subsp. *chersonensis*, as most recently pointed out by Chrtek (1973). However, the achenes of both *P. lusitanica* and its subsp. *chersonensis* are brown even in full mature, with often brownish firmer perianth-lobes and elongate lanceolate bracts, while those of *P. micrantha* are black in mature, with membranaceous (not accrescent) perianth-lobes and ciliate linear bracts.

Pilea approximata C. B. Clarke: Fl. E. Himal. 61 (1966).

NEPAL. Dor–Tinjure, 2800 m (Jun. 7, 1972, fl.); Lamo Pokhari, 2900 m (Jun. 9, 1972, no. 726038, fl.).

DARJEELING. Senchal, 2400 m (Jul. 6, 1967, fl.).

Distr. E. Himalaya (Nepal to Bhutan).

The species is very near to *Pilea racemosa* (Royle) Tuyama.

Pilea bracteosa Wedd., Monogr. Urtic. 245 (1856); in DC., Prodr. **16**(1): 134 (1869)–Fl. Brit. Ind. **5**: 555 (1888).

P. bracteosa var. *striolata* Hand.-Mzt., Symb. Sin. **7**: 137 (1929).

DARJEELING. (Jun. 21, 1960); Raman–Rimbick, 2000 m (Aug. 5, 1972).

SIKKIM. Gangtok, Lagyap, 2200 m (Hara & Pradhan, Sep. 13, 1964, fr.).

BHUTAN. Mishichen–Khosa, 1600–1800 m (May 10, 1967, fl.); Khosa–Tamji, 1800–2200 m (May 11, 1967, fl.); Chimakhothi–Phuntsholing, 2350–300 m (Jun. 2, 1967, fl.).

Distr. Himalaya (Nepal to Bhutan), Khasia, Burma, and W. China.

var. **oxyodon** (Wedd.) Hara, comb. nov.

Pilea oxyodon Wedd., Monogr. Urtic. 221 (1856); in DC., Prodr. **16** (1): 126 (1869).

NEPAL. Tingsang, Kalingchok, 2900 m (Sep. 12, 1970, fl. & fr.).

DARJEELING. Gairibas–Tonglu, 2800–3000 m (Jun. 7, 1960).

Distr. E. Himalaya (Nepal to Bhutan).

As suggested by Hooker f. (1888), *Pilea oxyodon* will be only a smaller glabrescent form with sharply serrate leaves of *P. bracteosa*. Some Eastern Himalayan specimens with sharply serrate ovate leaves have often been referred to *Pilea Wightii* Wedd. of South India, but they belong to either *P. bracteosa* var. *oxyodon* or a small form of *P. Symmeria*. The specimens of Nepal, Wallich 1821, no. 4589B, are also a mixture of these two plants.

Pilea cordifolia Hook. f.: Fl. E. Himal. 61 (1966).

P. obliqua Hook. f., Fl. Brit. Ind. **5**: 558 (1888).

DARJEELING. East Birch Hill Road, 2100–2200 m (Jul. 24, 1969; Jul. 22, 1972, fl.); Batasi–Mani Bhanjyang, 2100–2200 m (Aug. 9, 1972, fl.).

Distr. Sikkim and Khasia.

Pilea glaberrima (Blume) Blume, Mus. Bot. Lugd.-Bat. **2**: 54 (1856).

Urtica glaberrima Blume, Bijdr. 493 (1826).

P. smilacifolia Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 186 (1854), nom. nud.] Monogr. Urtic. 181 (1856): Fl. E. Himal. 61 (1966).

P. Goglado Blume, Mus. Bot. Lugd.-Bat. **2**: 53 (1856).

Nepal. Pokhara, 900 m (Jun. 18, 1967, no. 26057, fr.).

Distr. E. Himalaya (Nepal, Sikkim), Khasia, Burma, and Java.

The Himalayan plants seem to somewhat differ from typical *Pilea glaberrima* of Java, as suggested by Merrill (1941).

Pilea Kanaii Hara in Journ. Jap. Bot. **49**: 193 (1974). [Fig. 6]

Nepal. Sim Chotala–Ramche, 1500 m, on wet rock (Aug. 20, 1972, ♂ fl. Holotype in TI).

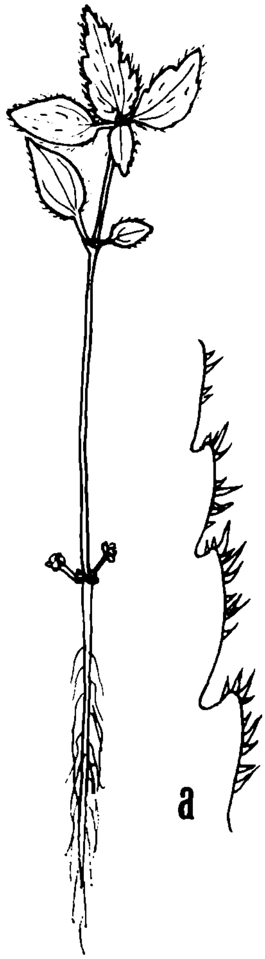

Fig. 6. *Pilea Kanaii* Hara. × 1. a. Leaf-margin.

Distr. Endemic to Nepal.

This is a striking species in having male inflorescences only at the basal node of stems, and leaves conspicuously setulose-ciliate on the margin, and often sparsely pilose with long stiff hairs on the upper surface.

Pilea Martinii (Lév.) Hand.-Mzt., Symb. Sin. **7**: 131 (1929), cum descr.

Boehmeria Martini Léveillé in Fedde, Rep. **11**: 551 (1913).

Nepal. Godawari–Phulchoki, 2700–3000 m (Jun. 23, 1967, no. 3020, fl.; Jun. 10, 1969; Jul. 15, 1972).

Distr. Himalaya (Nepal to ?Bhutan), N. Burma, and W. & C. China.

The perianth of male flowers in our specimens is generally pilose in the upper part with short appressed hairs.

Pilea racemosa (Royle) Tuyama in Fl. E. Himal. 61 (1966).

P. subalpina Hand.-Mzt., Symb. Sin. **7**: 142, t. 3, f. 4 (1929).

Nepal. Phulchoki, Kathmandu, 2500–3000 m (Aug. 9, 1969, fl.); Thale Bisauna–Tingoang, 3100 m (Sep. 11, 1970, fr.); Sano Tingsang, 3200 m (Sep. 26, 1970, fr.); Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972, fl.).

Darjeeling. Phalut, 3600 m (Jul. 18, 1969; Aug. 3, 1972, fr.).

Bhutan. Shodu–Barshong, 3700 m (May 24, 1967, fl.).

Distr. Himalaya (Garhwal to Bhutan), Tibet, and W. China.

This dwarf species occurs in the subalpine region, and is exceedingly variable. The rhizomes are generally tuberous; the leaves are ovate and obtuse-serrate in the type specimen from N. W. India (Herb. Royle, K), but sometimes roundish and coarsely serrate, occasionally subentire, rarely oblong and entire; the peduncles are sometimes long and filiform; and the achenes are oblong-ovate, 1–1.5 mm long and long exerted from the perianth-lobes.

Pilea Symmeria Wedd.: Fl. E. Himal. 62 (1966).

P. Wrightii Wedd. sensu Hook. f., Fl. Brit. Ind. **5**: 554 (1888), quoad specim.

ex Nepal.

NEPAL. Phulchoki, Kathmandu, 2400–2700 m (Sep. 19, 1970, fr.); Dor–Chauke, 2600–2900 m (Jun. 7, 1972); Topke Gola–Shewaden, 3000–2600 m (Jun. 28, 1972); Shewaden–Mewa Khola, 2500 m (Jun. 29, 1972, fl. & fr.); Nessum–Bhuje, 1300–2700 m (Jul. 3, 1972, fl.); Dor–Chitre, 2600–2300 m (Jul. 7, 1972, fl.); Chitre, 2400 m (Jul. 8, 1972, fl.).

DARJEELING. Tonglu–Sandakphu, 2800–3100 m (Jul. 13 & 21, 1969, fl.); Mekma–Tonglu, 2600–3000 m (Jul. 30, 1972, fl.); Phalut–Raman, 2100 m (Aug. 4, 1972, fl.); Palmajua–Batasi, 2200–2100 m (Aug. 8, 1972, fl.).

BHUTAN. Tzatogang–Dotanang, 3200–2700 m (May 27, 1967).

Distr. Himalaya (Kumaon to Bhutan), Khasia, and W., S. & C. China.

The species is considerably variable. The perianth-lobes of male flowers are sometimes conspicuously rostrate at the apex, and very rarely minutely pilose.

Pilea ternifolia Wedd.: Fl. E. Himal. 62 (1966).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972, fr.); Palmajua–Batasi, 2200–2100 m (Aug. 8, 1972, ♂ fl.).

var. **exmucronata** Hara, var. nov.

A typo differt lobis perianthii floris ♂ apice haud mucronatis.

NEPAL. Tute–Dor, 2400 m (Jun. 6, 1972, no. 720216, ♂ fl. Holotype in TI).

Distr. sp. E. Himalaya (E. Nepal, Sikkim).

Pilea umbrosa Blume, Mus. Bot. Lugd.-Bat. **2**: 56 (Feb. 1856).

Urtica umbrosa Wallich, Cat. no. 4589 (1831), nom. nud.

P. umbrosa Wedd. [in Ann. Sci. Nat. ser. 4, **1**: 187 (1854), nom. nud.] Monogr. Urtic. 243 (1856): Fl. E. Himal. 62 (1966).

P. producta Blume, Mus. Bot. Lugd.-Bat. **2**: 56 (1856), e typo.

NEPAL. Above Dunche–Gosainkund, 2600–3000 m (Jun. 4, 1969); Sheopuri, Kathmandu, 2700 m (Jun. 14 & 15, 1969); Sanguri Bhanjyang, 1130 m (Jun. 2, 1972, no. 720130, fr.); Bir Gaon, 1600 m (Jul. 1, 1972, fr.).

DARJEELING. 2250 m (Jun. 23, 1969, fr.).

SIKKIM. Singhik–Gangtok, 1500–1900 m (Jul. 1, 1969, fl.).

Distr. Himalaya (Kashmir to Sikkim), Khasia, and W. China.

var. **obesa** Wedd., Monogr. Urtic. 243 (1856); in DC., Prodr. **16** (1): 134 (1869), cum descr., excl. *P. Wallichii* Wedd., nom. nud.

Urtica obesa Wallich, Cat. no. 4587 (1831), nom. nud.

P. obesa Wedd. in Ann. Sci. Nat. ser. 4, **1**: 186 (1854), nom. nud.

P. Wightii Wedd. sensu Hook. f., Fl. Brit. Ind. **5**: 554 (1888), quoad syn. *U. obesa.*

P. Kingii C. E. C. Fischer in Kew Bull. **1927**: 76 (1927), quoad specim. ex Nepal.

NEPAL. (Wallich 1821, no. 4587. Lectotype in KW); Phulchoki, Kathmandu, 2300–2700 m (Aug. 9, 1969, no. 673360, ♂ fl.); Chitre, 2400 m (Jul. 7, 1972, no. 721165, ♂ fl.).

Distr. Nepal.

Urtica obesa Wall. was considered by Hooker f. (1888) as a form of *Pilea Wightii* Wedd., and later by C.E.C. Fischer (1927) as a synonym of his *Pilea Kingii*, but it is clearly different from both of them from S. India, and is much nearer to *Pilea* *umbrosa* in the characters of leaves, cystoliths, stipules and achenes, as first treated by Weddell. It slightly differs from typical *P. umbrosa*, and the leaves are glabrescent only with scattered white stiff hairs above, the peduncles are elongate often up to 15 cm long, and the rachis is minutely pubescent on one side.

I have also examined the type specimen of *Pilea producta* Blume kindly sent on loan by courtesy of the director of Rijksherbarium at Leiden, and it is surely identical with *P. umbrosa*. The Chinese specimens referred to *P. producta* by Handel-Mazzetti (1929) include different plants.

Pouzolzia sanguinea (Blume) Merrill in Journ. Str. Branch Asiat. Soc. Spec. no. **84**: 233 (1921); in Contr. Arnold Arb. **8**: 52 (1934).

Urtica sanguinea Blume, Bijdr. 500 (1826).

U. viminea Wallich, Cat. no. 4616 (1831), nom. nud.

Boehmeria sanguinea (Blume) Hassk., Cat. Hort. Bogor. 79 (1844).

P. ovalis Miquel, Pl. Junghn. 24 (1851)–Wedd., Monogr. Urtic. 410 (1857).

Margarocarpus vimineus Wedd. in Ann. Sci. Nat. ser. 4, **1**: 203 (1854), cum descr.

B. viminea Blume, Mus. Bot. Lugd.-Bat. **2**: 202 (1857).

P. viminea (Wedd.) Wedd. in DC., Prodr. **16**(1): 228 (1869)–Fl. Brit. Ind. **5**: 581 (1888).

NEPAL. Saju Khola, 1400 m (Jul. 1, 1972, fl.); Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972, fl.).

DARJEELING. 2200 m (Dec. 26, 1963, fr.).

SIKKIM. Gangtok–Rangpo, 1600–350 m (Jun. 18, 1960, fl.).

Distr. Himalaya (Kumaon to Bhutan), Assam, Manipur, Burma, China, Formosa, and Malaysia.

Boehmeria frondosa D. Don (1825) based on a specimen 'Nepalia, Wallich' was cited by Weddell (1857) as a synonym of *Pouzolzia ovalis* var. *fulgens* Wedd. with a question mark, and later by Hooker f. (1888) as a synonym of *P. viminea*. If so, D. Don's name is the earliest epithet for this species. Unfortunately any authentic specimen so named by D. Don is not extant in the British Museum. However, in almost all cases when D. Don's species are based on Wallich's collections from Nepal, some specimens which agree well with D. Don's original description can be found among Wallich's specimens from Nepal in the British Museum or Kew. Among Nepalese urticaceous plants, those which do not contradict to the original description of *Boehmeria frondosa* seem to be *Pouzolzia sanguinea* var. *fulgens*1) or *Oreocnide frutescens*. A phrase 'foliis . . . subtus niveo-tomentosis' seems to suggest *P. sanguinea* var. *fulgens*, but this variety has not been collected by Wallich and also any later collectors from C. Nepal, and also its leaves are generally broadly cuneate at the base. While, two specimens of *Oreocnide frutescens* are found at Kew; one is 'Nepal (Dr. Wallich)' in Herb. Hook., and the other 'Wallich 9091 Nipal' in Herb.

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1) Pouzolzia sanguinea (Blume) Merrill.
var. **fulgens** (Wedd.) Hara, comb. nov.
Urtica Chiple Hamilt. in Wall., Cat. no. 4616D (1831), nom. nud.
U. parvifolia Hamilt. in Wall., l.c. 4616F (1831), nom. nud.
Pouzolzia ovalis ε. *fulgens* Wedd., Monogr. Urtic. 411 (1857).
Distr. Himalaya (Nepal to Bhutan), Assam, Manipur, and Burma.

Hook. (not Wallich no. 9091 in Herb. Wallich).

The former specimen especially has ovate leaves which are roundish at the base and white-tomentose beneath, and agrees fairly well with the original description of *Boehmeria frondosa.* Also the fact must be taken into consideration that the specimen (BM) identified as *Boehmeria frutescens* by D. Don (1825) is proved to be *Maoutia Puya* (Hook. f.) Wedd., and it is quite probable that D. Don described the true *Boehmeria frutescens* (*Oreocnide*) as a new species i.e. *Boehmeria frondosa.* Under these circumstances, I here designate the specimen of *Oreocnide*, 'Nepal (Wallich)' above mentioned in Kew, as the neotype of *Boehmeria frondosa* D. Don, in order to avoid further confusion in nomenclature of the species of *Pouzolzia.*

var. **nepalensis** (Wedd.) Hara, comb. nov.

Boehmeria nepalensis Wedd., Monogr. Urtic. 383 (1856).

B. rugulosa var. *tenuis* King ex Hook. f., Fl. Brit. Ind. **5**: 577 (1888), in nota, nom. non rite public.

NEPAL. (Wallich no. 9091. Isotype of *B. nepalensis* KW, K, BM); Thale, Langtang, 2000 m (Jun. 24, 1970, fl.).

DARJEELING. East Birch Hill Road, 2200 m (Jul. 29, 1969, fl.); Raman–Rimbick, 2000 m (Aug. 5, 1972, fl.).

SIKKIM. Singhik–Gangtok, 1500–1900 m (Jul. 1, 1969, fl.).

Distr. E. Himalaya (Nepal, Sikkim).

In this variety, the male-flower clusters are arranged in long leafless spikes as in *Boehmeria,* but the female-flower clusters are axillary. However, the male flower spikes occasionally bear a few leaves, and there seem to be some transitional forms between this variety and the mother species. The relationship between the two should be carefully studied in the field. It is noteworthy that one specimen at Kew with the label, Nipal, Wallich no. 9091, is *Oreocnide frutescens.*

Procris crenata C. B. Robinson in Philip. Journ. Sci. **5**: 507 (1911)–G. Taylor in Excell, Cat. Pl. S. Thomé 312 (1944).

P. Wightiana Wall. [Cat. no. 4638 (1831), nom. nud.] ex Wedd., Monogr. Urtic. 336 (1856), nom. superfl.–Schröter in Fedde, Rep. **45**: 179 & 257 (1938).

P. laevigata Blume sensu Hook., Icon. Pl. **13**: 74, t. 1295 (1879)–Fl. Brit. Ind. **5**: 575 (1888).

BHUTAN. Tinlegang, 1950 m (May 4, 1967, fr.).

Distr. Himalaya (Nepal to Bhutan), India, Ceylon, Manipur, Indo-China, China, Formosa, Bonin, Philippines, and Africa.

Urtica ardens Link, Enum. Hort. Berl. **2**: 385 (1822).

U. virulenta Wallich, Cat. no. 4586 (1831), nom. nud.

U. parviflora Roxb., Fl. Ind. ed. 2, **3**: 581 (1832)–Wedd., Monogr. Urtic. 85 (1856), p.p.–Fl. Brit. Ind. **5**: 548 (1888), p.p.

U. himalayensis Kunth et Bouché in Ann. Sci. Nat. ser. 3, **7**: 182 (1847)–Wedd. in Ann. Sci. Nat. ser. 4, **1**: 180 (1854).

NEPAL. Dunche–Singum Gompa, 1900–3000 m (Aug. 22, 1972, fl.).

DARJEELING. Rimbick–Raman, 1900–2400 m (May 7, 1960, fl. & fr.).

Distr. Himalaya (Kashmir to Sikkim) and W. China.

Urtica Mairei Léveillé in Fedde, Rep. **12**: 183 (1913)–Hand.-Mzt., Symb.

Sin. **7**: 116 (1929).

U. parviflora Roxb. sensu Hook. f., Fl. Brit. Ind. **5**: 548 (1888), p.p.: Fl. E. Himal. 62 (1966).

DARJEELING. Rimbick–Raman, 1900–2400 m (May 7, 1960); Darjeeling, 2100 m (Jun. 24, 1960).

BHUTAN. Tzatogang–Dotanang, 3200–2700 m (May 27, 1967, fl.).

Distr. Himalaya (Kashmir to Bhutan), S. Tibet, N. Burma, and W. China.

In the typical plant of Maire, the stems and petioles are densely covered with long setose-hairs, but some specimens of Yunnan are glabrescent only with scattered bristles, and agree with Eastern Himalayan ones.

BALANOPHORACEAE (by Hiroshi Hara)

Balanophora involucrata Hook. f.: Hara, Fl. E. Himal. 66 (1966)–Hansen in Dansk Bot. Ark. **28** (1): 152, f. 41 (1972).

DARJEELING. Tonglu–Gairibas, 2850 m (Jul. 31, 1972, fl.).

Distr. Himalaya (Punjab to Sikkim), Tibet, and W. China.

ARISTOLOCHIACEAE (by Hiroshi Hara)

Aristolochia Tagala Chamisso in Linnaea **7**: 207, t. 5, f. 3 (1832)–Merrill, Enum. Philip. Fl. Pl. **2**: 120 (1923).

A. Roxburghiana Klotzsch.: Hara, Fl. E. Himal. 66 (1966).

NEPAL. Dingla, 1000 m (Jul. 2, 1972, no. 721006, fl. & fr.).

Distr. E. Himalaya (Nepal, Sikkim), India, Ceylon, and Malaysia.

Corolla lobe slender, developed upward, black purple with short hairs, base revolute. Corolla tube and mouth dirty white yellow, tube glabrous with purple network. Corolla base globose, dark purple, inside hairy without reticulation. Stamens 6. Filaments plank-shaped, erect, connate each other. Anthers embedded at the center of filament, extrorse. (Note by Hiroo Kanai).

POLYGONACEAE (by Hiroshi Hara)

Bistorta affinis (D. Don) Greene, Leafl. **1**: 21 (1904).

Polygonum affine D. Don, Prodr. Fl. Nepal. 70 (1825)–Hook. f. in Bot. Mag. t. 6472 (1880); Fl. Brit. Ind. **5**: 33 (1886)–Steward in Contr. Gray Herb. **88**: 28 (1930).

P. Donianum Spreng., Syst. Veg. **4** (2): 154 (1827).

NEPAL. Gadje–Surjakund, 4300 m (Aug. 26, 1969, fl.); Mul Kharka, Chilime, 4000 m (Jul. 6, 1970, fl.); Lama Chungbu–Slesa, 4300 m (Jun. 24, 1972, fl.).

Distr. Himalaya (Kashmir to Nepal) and Tibet.

Bistorta amplexicaulis (D. Don) Greene: Hara, Fl. E. Himal. 69 (1966).

Polygonum speciosum Meisn., Monogr. Polygon. 66 (1826)–Wall., Cat. no. 1716 (1828).

P. amplexicaule var. *speciosa* (Meisn.) Hook. f., Fl. Brit. Ind. **5**: 33 (1886).

NEPAL. Lama Chungbu–Thudam, 4200–3400 m (Jun. 24, 1972, fl.); Thudam, 3400 m (Jun. 25, 1972, fl.); Phulchoki, 2200–2700 m (Jul. 15, 1972, fl.); Trisuli Khola–Singum Gompa, 2800 m (Aug. 22, 1972, fl.); Gosainkund–Gopte, 4000–3500 m (Aug. 25, 1972, fl.)*; Gopte–Thale Patil, 3200–3400 m (Aug. 26, 1972, fl.)*.

DARJEELING. Gairibas–Kalapokhari, 2900 m (Jul. 13, 1969 & Jul. 31, 1972, fl.); Phalut, 3800 m (Jul. 18, 1969, fl.); Sandakphu, 3600 m (Aug. 1, 1972, fl.)*.

var. **pendula** Hara, var. nov. [Plate 2a]

Spica distincte nutans 3–7 cm longa 13–18 mm crassa densiflora, floribus intense purpureo-rubris ca. 5 mm longis. Folia subtus ad nervos minutissime papillosa.

NEPAL. Rock Shelter II–Gotiora, Gosainkund, 3250 m (Aug. 25, 1969, fl.); Godje–Surjakund, 4200 m (Aug. 26, 1969, fl.); Gopte–Thale Patil, 3500–3200 m (Aug. 26, 1972, no. 721979, fl. Holotype in TI).

Distr. sp. Afghanistan, Himalaya (Kashmir to Bhutan), and W. & C. China.

This species is variable in the size and colour of flowers and the hairiness of leaves. Some specimens marked with * have shorter dense spikes with larger deep purple-red flowers 5–6 mm long, and correspond with *Polygonum speciosum* Meisn. Some of our specimens have glabrous leaves, some have leaves very minutely papillose on nerves beneath, while some have leaves softly pubescent beneath.

In the Gosainkund district, var. *pendula* with drooping spikes forms a separate colony from the typical one with ascending spikes. On the Singalila Range, a few plants of *B. amplexicaulis* have slightly nodding spikes.

Bistorta macrophylla (D. Don) Soják in Preslia **46**: 152 (1974).

Polygonum macrophyllum D. Don, Prodr. Fl. Nepal. 70 (1825)–Steward, l.c. 36 (1930).

P. sphaerostachyum Meisn., Monogr. Polygon. 53 (1826)–Fl. Brit. Ind. **5**: 32 (1886), p.p.

NEPAL. Thale Bisauna–Tingoang, Kalingchok, 2750–3100 m (Sep. 11, 1970, fl.); Topke Gola, 3600 m (Jun. 18, 1972, fl.); Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972, fl.); Singum Gompa–Gosainkund, 4000 m (Aug. 23, 1972, fl. pink); Gopte–Thale Patil, 3300 m (Aug. 26, 1972, fl. pink).

Distr. Himalaya (Garhwal to Bhutan), Assam, and W. & C. China.

The leaves are sometimes glabrous and only minutely papillose on nerves beneath, but sometimes pubescent beneath.

Bistorta Milletii Léveillé in Fedde, Rep. **12**: 286 (1913).

Polygonum sphaerostachyum Meisn. sensu Hook. f. in Bot. Mag. t. 6847 (1885).

P. Milletii Lév., l.c. 286 (1913), pro syn.–Steward, l.c. 35 (1930).

NEPAL. Tsedang Pokhari, 3000 m (Aug. 23, 1969); Gopte–Thale Patil, 3400 m (Aug. 26, 1972, fl. rose-red).

Distr. Nepal and W. China.

CARYOPHYLLACEAE (by Hideaki Ohba)

Arenaria ciliolata Edgew. in Fl. Brit. Ind. **1**: 240 (1874)–Duthie, List N. W. Ind. Pl. 22 (1881)–Williams in Journ. Linn. Soc. **33**: 373 (1898).

NEPAL. Gosainkund, 4400 m (Aug. 24, 1972, fl.).

Distr. Himalaya (Garhwal, Kumaon, Nepal, and Sikkim).

Arenaria densissima Wall. ex Edgew. et Hook. f.: Mizushima in Fl. E. Himal. **2**: 25 (1971).

NEPAL. Ghopte–Gosa, 3500–4100 m (Jun. 13, 1972, fl.); Kipuphu, 4500 m (Jun. 26, 1972, fl.); Phujeng La, 4640 m (Jun. 27, 1972, fl.); Gosainkund, 4200 m (Aug. 23, 1972, fl.).

Arenaria globiflora Wall. [Cat. no. 639 (1829), nom. nud.] ex Edgew. et Hook. f. in Fl. Brit. Ind. **1**: 238 (1874)-Williams in Journ. Linn. Soc. **33**: 406 (1898)-Mizushima in Kihara, Fauna Fl. Nepal Himal. 122 (1955).

Cherleria grandiflora D. Don, Prodr. Fl. Nepal. 214 (1825).

Dolophragma globiflorum Fenzl in Ann. Wien. Mus. Naturgesch. **1**: 63, t. 71 (1836).

NEPAL. Gosainkund, 4200 m (Aug. 24, 1972, fl.).

Distr. E. Himalaya (Nepal).

Arenaria orbiculata Royle ex Edgew. et Hook. f. in Fl. Brit. Ind. **1**: 240 (1874)-Duthie, List N. W. Ind. Pl. 22 (1881)-Williams in Journ. Linn. Soc. **33**: 356 (1898).

NEPAL. Jarjare-Roll, 2080–3100 m (May 2, 1970, fl.); Topke Gola-Jalang Chhyongo, 3800 m (Jun. 20, 1972, fl.).

BHUTAN. Gon Chungnang–Punakha, 1800–1400 m (May 6, 1967, fl.); Chamsa-Yabu Thang, 3700–3400 m (May 15, 1967, fl.); Shodu-Barshong, 3600 m (May 24, 1967, fl.); Barshong-Nala, 3300 m (May 25, 1967, fl.); Tzatogang-Dotanang, 3200–2700 m (May 27, 1967, fl.).

Distr. Afghanistan, Pakistan, and temperate Himalaya (Kashmir to Bhutan).

Cerastium holosteoides Fries, Nov. Fl. Suec. **4**: 52 (1817).

subsp. **triviale** (Link) Möschl in Bot. Not. **1948**: 375 (1948).

var. **angustifolium** (Franch.) Mizushima in Journ. Jap. Bot. **43**: 54 (1968).

C. holosteoides subsp. *triviale* var. *hallaisanense* (Nakai) Mizushima: Mizushima in Fl. E. Himal. 80 (1966).

NEPAL. Mure, 2000 m (Jun. 5, 1972, fl. & fr.); Hile Chok-Ghopte, 3450 m (Jun. 12, 1972, fl.).

Distr. var. Himalaya (E. Nepal), China, Formosa, Korea, and Japan.

Drymaria diandra Blume: Fl. E. Himal. 80 (1966).

NEPAL. Godawari, 1500 m (Sep. 8, 1970); Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972, ster.).

Drymaria villosa Chamisso et Schlechtendal: Fl. E. Himal. 80 (1966).

NEPAL. Sanguri Bhanjyang–Dhara Pani, 1000 m (Jun. 2, 1972, fl.); Bir Gaon–Dingla, 1600–1000 m (Jul. 1, 1972, fl.); Ramche-Gram, 1800–1900 m (Aug. 20, 1972, fl. & fr.).

DARJEELING. Raman–Rimbick, 1900–2400 m (Aug. 5, 1972, fl. & fr.); Batasi–Mani Bhanjyang, 2100–2000 m (Aug. 9, 1972, fl. & fr.); Darjeeling–Thame, 2000-2200 m (Aug. 10 & 12, 1972, fl. & fr.).

Gypsophila cerastioides D. Don: Fl. E. Himal. **2**: 25 (1971).

NEPAL. Mul Kharka, 3800–4100 m (Jul. 4, 1970, fl.); Saju Pokhari–Topke Gola, 4300 m (Jun. 16, 1972, fl.); Topke Gola, 3600 m (Jun. 17 & 18, 1972, fl.); Topke Gola-Jalang Chhyongo, 4000 m (Jun. 20, 1972, fl.); Thudam-Lama Chungbu, 3800 m (Jun. 23, 1972, fl.).

Lepyrodiclis debilis (Hook. f.) H. Ohba, comb. nov.

Arenaria debilis Hook. f., Fl. Brit. Ind. **1**: 242 (1874)-Franch. in Bull. Soc. Bot. France **33**: 432 (1886)-Williams in Journ. Linn. Soc. **33**: 431 (1898)-Pax et Hoffmann in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl., **16**c: 317 (1934), in sect. xi

Odontostemma.

NEPAL. Saju Pokhari, 4000 m (Jun. 16, 1972, fl.).

DARJEELING. Tonglu–Sandakphu, 3100–3970 m (Jul. 13, 1969, fl.); Sandakphu, 3500 m (Jul. 14 & 15, 1969, fl.).

Distr. E. Himalaya (Nepal & Sikkim). Probably this is new to Nepal.

Lepyrodiclis glandulosa (Benth. ex G. Don) H. Ohba, comb. nov.

Adenostemma glandulosum Benth. in Wall., Cat. no. 645 (1829), nom. nud.

Odontostemma glandulosum Benth. ex G. Don, Gen. Syst. Bot. **1**: 449 (1831).

Arenaria Benthami Edgew. in Fl. Brit. Ind. **1**: 242 (1874), non Fenzl. (1840).

Arenaria glandulosa (Benth. ex G. Don) Williams in Journ. Linn. Soc. **33**: 431 (1898)-Pax et Hoffmann, l.c. 317 (1934)–Fl. Phulchoki & Godawari 10 (1969).

NEPAL. Oo Kharka–Mul Kharka, 3700 m (Jul. 1, 1970); Lukthang–Kalingchok, 3400 m (Sep. 28, 1970); Gosainkund–Surjakund, 3700 m (Aug. 25, 1972, fl. & fr.); Gopte–Thale Patil, 3200–3500 m (Aug. 26, 1972, fl.).

DARJEELING. Kala Pokhari–Sandakphu, 3000 m (Jul. 31, 1972, fl.); Sandakphu, 3600 m (Aug. 1, 1972, fl.); Sandakphu–Phalut, 3300 m (Aug. 2, 1972, fl.).

Distr. Himalaya (Kumaon, Nepal, and Sikkim).

The genus *Lepyrodiclis* is clearly distinguishable from the genus *Arenaria* in having petals with incised apex, pistils with 2(–3) styles, etc. The sect. Odontostemma (Benth.) Pax of *Arenaria* seems to be included in *Lepyrodiclis*.

L. glandulosa differs from *L. debilis* in having obtriangular petals, longer styles and ellipsoidal ovaries.

Lychnis himalayensis (Rohrb.) Edgew.: Fl. E. Himal. 81 (1966).

NEPAL. Mul Kharka–Chilime Khola, 3800–4100 m (Jul. 2, 1970, fl.); Thudam, 3400 m (Jun. 24, 1972, fl.); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972, fl.).

Lychnis indica Benth. in Royle, Ill. Bot. Himal. 81 (1839)–Edgew. et Hook. f. in Fl. Brit. Ind. **1**: 225 (1874)–Mizushima in Kihara, Fauna Fl. Nepal Himal. 124 (1955).

Melandrium indicum (Benth.) Boiss., Fl. Orient. Suppl. 109 (1888).

NEPAL. Dunche–Singum Gompa, 3000 m (Aug. 22, 1972, fl.); Mangen–Khodang Danda, 3100–2500 m (Aug. 28, 1972).

Distr. Pakistan and Himalaya (Kashmir to Nepal).

Lychnis nigrescens Edgew. in Fl. Brit. Ind. **1**: 223 (1874).

NEPAL. Topke Gola–Jalang Chhyongo, 4000 m (Jun. 20, 1972, fl.); Lama Chungbu, 4200 m (Jun. 24, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972, fl.).

Distr. E. Himalaya (Nepal and Sikkim). This is new to Nepal.

Lychnis nutans Benth. in Royle, Ill. Bot. Himal. 80 (1839)–Edgew. et Hook. f. in Fl. Brit. Ind. **1**: 225 (1874).

DARJEELING. Sandakphu–Phalut, 3300–3600 m (Jul. 16, 1969, fl.; Aug. 2, 1972, fl.); Phalut–Singalila, 3600 m (Aug. 3, 1972, fl.).

Distr. Himalaya (Kunawar to Sikkim).

Polycarpon indicum (Retz.) Merrill: Fl. E. Himal. 81 (1966).

NEPAL. Bir Gaon–Dingla, 1000 m (Jul. 1, 1972, fl.); Doban, 800 m (Jul. 2, 1972, fl.).

Pseudostellaria heterantha (Maxim.) Pax ex Pax et Hoffm. in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl., **16c**: 318 (1934)–Schäftlein in Phyton **7**: 193 (1957)–

Mizushima in Bull. Bot. Surv. Ind. **7**: 68 (1965).

Kraschenìnnikovia heterantha Maxim. in Bull. Acad. Sci. St.-Pétersb. **18**: 382 (1873).

BHUTAN. Gasa–Chamsa, 2800–3700 m (May 14, 1967, fl.); Chabecha–Lingshi, 3800–4100 m (May 22, 1967, fl.); Tzatogang–Dotanang, 2700 m (May 27, 1967, fl.).

Distr. E. Himalaya (Bhutan), China, and Japan. New to Himalaya.

Sagina japonica (Sw.) Ohwi: Fl. E. Himal. 81 (1966); **2**: 26 (1971).

NEPAL. Thale–above Dunche, 2100–2200 m (Jun. 3, 1969, fl.); Thale–Sim Chotala (Jun. 6, 1969, fl.); Mure, 2000 m (Jun. 5, 1972, fl.); Chauke–Lamo Pokhari, 2600–2900 m (Jun. 8, 1972, fl.); Suke–Hile Chok, 2900–3600 m (Jun. 11, 1972, fl.); Dor–Chitre, 2300–2600 m (Jul. 7, 1972, fl. & young fr.); Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972, fl. & fr.).

SIKKIM. Singhik–Gangtok, 1500–1900 m (Jul. 1, 1969, fl. & fr.).

DARJEELING. Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972, fr.).

Stellaria Alsine Grimm. in Nov. Act. Leopold. **3**: app. 313 (1767).

S. Alsine Grimm. var. *undulata* (Thunb.) Ohwi: Fl. E. Himal. 82 (1966).

NEPAL. Kathmandu (May 27, 1969, fl.).

Distr. Temperate regions of N. Hemisphere.

Stellaria decumbens Edgew.: Fl. E. Himal. 82 (1966); **2**: 26 (1971).

NEPAL. Gotiora–Gadje, 3500 m (Aug. 25, 1969, fl.); Mul Kharka, Chilime Khola, 3800 m (Jul. 4, 1970, fl.); Kyangjing, Langtang Khola, 3700 m (Jul. 15, 1970, fl.); Topke Gola, 3800 m (Jun. 18, 1972, fl.); Thudam, 3400 m (Jun. 24, 1972, fl.); Thudam–Kipudonsu, 3400–4200 m (Jun. 26, 1972, fl.).

DARJEELING. Tonglu–Sandakphu, 3500 m (Jul. 13, 1969, fl.); Phalut, 3900 m (Jul. 17, 1969, fl.); Sandakphu–Phalut, 3300 m (Aug. 2, 1972, fl.).

Stellaria lanata Hook. f.: Fl. E. Himal. 82 (1966); **2**: 26 (1971).

DARJEELING. Sandakphu, 3500 m (Jul. 15, 1969, fl.); Phalut–Mt. Singalila, 3950 m (Jul. 17, 1969, fl.).

Stellaria monosperma Hamilt. ex D. Don, Prodr. Fl. Nepal. 215 (1825).

var. **monosperma**

S. monosperma D. Don var. *monosperma* form. *paniculata* (Edgew.) Mizushima: Fl. E. Himal. 83 (1966).

NEPAL. Langtang Gorge–Langtang, 3000 m (Jul. 12, 1970, fl.); Thale Bisauna–Tingoang, Kalingchok, 3100 m (Sep. 11, 1970, fl.); Phulchoki, 2400–2700 m (Chuma, Sep. 19, 1970, fl.); Sheopuri (Chuma, Sep. 22, 1970, fl.).

DARJEELING. Senchal, 2400 m (Sep. 19, 1964); Batasi–Mani Bhanjyang (Aug. 9, 1972).

Distr. var. N. E. Afghanistan, temperate Himalaya (Kashmir to Sikkim), N. W. Assam, Madras, and Indo-China.

Stellaria neotomentosa Mizushima ex H. Ohba, sp. nov. [Fig. 7]

A *S. Uchiyamana* Makino floribus bracteatis et cymam formatis (non ebracteatis nec semper solitariis) et pilis simplicibus (nec stellatis) differt.

Herba perennis, modice radicata, caule longe repenti prope basin valde furcato. Rami decumbentes vel prostrati, teretiusculi vel triangulares, e gemmis axillaribus caulium perhiemantium emergentes, simplices sed infra corymbose furcati, dense vel modice strigoso-pilosi (pilis albis 0.4–0.7 mm longis). Folia simplicia exstipulata opposita paribus aequimagnis brevissime petiolata (petiolo piloso plerumque 2 mm

longo), sursum gradatim minora; lamina vere vel late ovata apice obtuse apiculata vel acuta basi rotundato brevi-attenuata, herbacea infra pallida, margine integra sed dense strigoso-pilosa, utrinque sparsim vel modice pilosa (pilis albis 0.4–0.7 mm longis), 1–1.8 cm longa 0.6–1.2 cm lata 1.5–2-plo longiora quam latiora; costa infra leviter prominenti sed supra plus minusve prominula vel non prominenti; venis sparsim reticulatis et non attingentibus sed utrinque invisibilibus. Flores axillares sed vix terminales, cymam (floribus numero (1–)3–5) efformantes, ante anthesin anguste lanceolati; bractea sessili foliis insigniter diversa, lanceolata apice attenuato acuta scariosa 1-nervi paene glabrata, 3–4 mm longa 0.6–1.0 mm lata; pedicello 2–4 cm longo, modice vel sparsim piloso. Calyx basi obconicus (altitudine circa 1.4 mm) et leviter connatus vel paene distinctus; sepalis 5, basi plus minusve imbricatis, lanceolatis vel lanceolato-triangularibus apice acutis vel acute apiculatis basi rotundato late cuneatis, papyraceis margine integris et angustissime scariosis, utrinque glabris, 5–6.7 mm longis 1.7–2 mm latis, e basi 3-nervis; nervis mediis lateralibusque extus plus minusve prominentibus. Petala 5, libera subsessilia, sepalis paulo (circa 1.2-plo) longiora, membranacea, prope basin profundissime in bipartes anguste ovatas vel anguste ellipticas apice rotundatas basi longe attenuatas margine integras 5.3–5.8 mm longas 1.7–2.2 mm latas divisa. Stamina plerumque 10, filamento subulato, petalis breviore, circa 5 mm longo, alternipetalis (numero 5) paulum lobis disci annularis glandulosi insidentia; antheris ut videtur sub anthesin purpureis. Ovarium fere ovoideum circa 2.5 mm longum 1.5 mm latum, subsessile, circa 30–40-ovulatum; stylo 3 filiformi glabro, apice in stigma lineare brevissime glandulosum (glandulis densis et 0.05–0.08 mm longis) simplex continue producto, (cum stigmate) circa 3 mm longo. Capsula longe ovoidea, calyce 1.2–1.4-plo longior, 7–8 mm longa, multiseminalis, in valvulas numero 6 lanceolatas obtusas dehiscens. Semina pauxillum compressa, circa 1.2 mm diametro, testa brunnea distincte tuberculata.

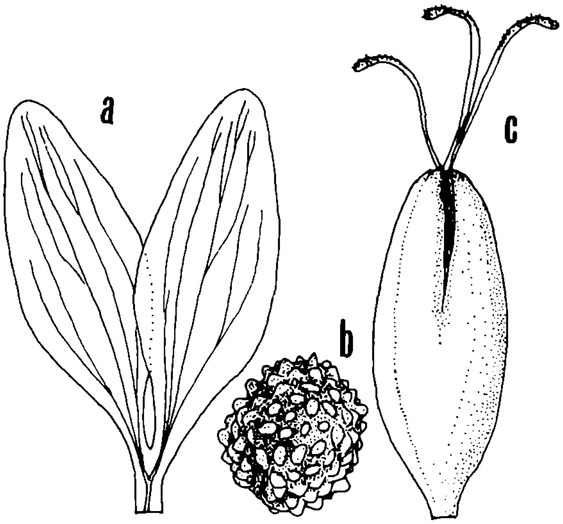

Fig. 7. *Stellaria neotomentosa* Mizushima ex H. Ohba.
a. Petal, ×7.5, b. Seed, ×15, c. Pistil, ×7.5.

NEPAL. Godawari, 1600 m (Hara et al., Jun. 23, 1967); Godawari–Phulchoki, 2100–

3000 m (Hara, Kurosawa & Ohashi, May 29, 1969. Holotypus in TI); loc. cit., 2200 m (Ohashi & Ohba, May 28, 1972, no. 726417).

Distr. E. Himalaya (Endemic to Nepal).

This species superficially resembles *S. Uchiyamana* Makino from Japan, but greatly differs from the latter in having unbranched hairs and cymes with conspicuous leafy bracts.

Stellaria ovatifolia (Mizushima) Mizushima: Fl. E. Himal. 83 (1966).

NEPAL. Dunche–Singum Gompa, 2500 m (Aug. 22, 1972, fl.).

Stellaria patens D. Don: Fl. E. Himal. 84 (1966); **2**: 26 (1971).

NEPAL. Thale–above Dunche, 2065–2200 m (Jun. 3, 1969, fl.); above Dunche–Gosainkund, 2065–3000 m (Jun. 4, 1969, fl.); Sheopuri, 2700 m (Jun. 15, 1969, fl); Mure, 2000 m (Jun. 5, 1972, fl.).

DARJEELING. Sandakphu–Phalut, 3300–3970 m (Jul. 16, 1969, fl.).

Stellaria sikkimensis Hook. f.: Fl. E. Himal. 84 (1966); **2**: 26 (1971).

NEPAL. Chitre–Hile, 2300 m (Jul. 8, 1972, fl.).

SIKKIM. Singhik–Gangtok, 1500–1800 m (Jul. 1, 1969, fl.).

DARJEELING. Senchal–Ghum, 2300–2400 m (Jul. 6, 1969, fl.); Mani Bhanjyang–Tonglu (Jul. 30, 1972, fl.).

Stellaria vestita Kurz: Fl. E. Himal. 85 (1966).

NEPAL. Godawari (May 28, 1969); Hile–Chitre, 1900–2400 m (Jun. 5, 1972, fl.).

RANUNCULACEAE (by Hiroshi Hara)

Aconitum jucundum Diels in Not. Bot. Gard. Edinb. **5**: 266 (1912)–Hand.-Mzt. in Act. Hort. Gotob. **13**: 78 (1939)–Fletcher et Lauener in Not. Bot. Gard. Edinb. **20**: 192 (1950)–Hara in Journ. Jap. Bot. **47**: 269 (1972).

NEPAL. Minchin Dhap–Mul Pokhari, 2900–2500 m (Oct. 29, 1963, fr.); Baroya Khimty–Thakma Khola, 2800–3200 m (Nov. 16, 1963, fr.).

Distr. E. Himalaya (Nepal, Bhutan), N. Burma, and W. & C. China.

Adonis nepalensis Simonovicz in Nov. Syst. Pl. Vasc. URSS **7**: 146 (1971).

NEPAL. Saju Pokhari–Topke Gola, 4300 m (Jun. 16, 1972, no. 720542, fl. bright yellow).

Distr. C. & E. Nepal.

Anemone fuscopurpurea Hara in Journ. Jap. Bot. **48**: 353, f. 1 (1973).

NEPAL. Banduke Pokhari, 4200 m (Jun. 14, 1972, fl.); Banduke Pokhari–Saju Pokhari, 4200–4000 m (Jun. 15, 1972, no. 721252, fl. dark purple. Holotype in TI); Saju Pokhari–Topke Gola, 4400–3600 m (Jun. 16, 1972, fl.).

Distr. Endemic to E. Nepal.

This species is characteristic in having glabrescent and deeply lobed leaves, smaller narrow and dark purple sepals, and glabrescent carpels.

Anemone rupestris Wallich [Cat. no. 4696 (1831), nom. nud.] ex Hook. f. et Thoms., Fl. Ind. **1**: 21 (1855), p.p.; in Fl. Brit. Ind. **1**: 9 (1872), p.p.–Brühl in Ann. Bot. Gard. Calc. **5** (2): 79 (1896)–Hara in Journ. Jap. Bot. **48**: 354 (1973).

A. rupestris var. *pusilla* Brühl et var. *Wallichii* Brühl, l.c. 80 & 81 (1896).

A. rupestris subsp. *gelida* var. *Wallichii* (Brühl) Lauener in Not. Bot. Gard. Edinb. **23**: 200 (1960).

A. bhutanica Tamura in Act. Phytotax. Geobot. **19**: 75 (1962).

NEPAL. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972, no. 723628, fl.); Ghopte–Gosa, 3500–4100 m (Jun. 13, 1972, fl.); Gosainkund, 4200 m (Aug. 25, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

The typification of the name *Anemone rupestris* was discussed in detail by Hara (1973).

Anemone rupicola Cambess. in Jacquemont, Voy. **4**: 5, t. 2 (1838)–Fl. Brit. Ind. **1**: 8 (1872)–Bot. Mag. t. 9476 (1937).

NEPAL. Saju Pokhari–Topke Gola, 4300 m (Jun. 16, 1972, fl. white); Phujeng La–Topke Gola, 3800 m (Jun. 27, 1972, fl.).

Distr. Afghanistan, Himalaya (Kashmir to Bhutan), S. Tibet, and W. China.

Caltha palustris L. var. **himalensis** (D. Don) Mukerjee: Hara, Fl. E. Himal. 88 (1966).

NEPAL. Gosainkund, 4000 m (Aug. 24, 1972, no. 723891, fr.); Khodang Danda, 2500 m (Aug. 28, 1972, fr.).

Distr. sp. Europe, Himalaya, Siberia, China, Japan, and N. America.

Clematis alternata Kitamura et Tamura in Act. Phytotax. Geobot. **15**: 129 (1954); in Kihara, Fauna Fl. Nepal Himal. 126, f. 19 (1955). [Plate 2b]

Archiclematis alternata (Kitam. et Tamura) Tamura in Sci. Rep. Osaka Univ. **16**: 31 (1967); in Act. Phytotax. Geobot. **24**: 151, f. 1 & 2 (1970).

NEPAL. Khirojet-Yatumbal, 2600 m (Jun. 29, 1970, no. 672113, fl. dull rose).

Distr. Nepal.

Clematis tongluensis (Brühl) Tamura in Act. Phytotax. Geobot. **19**: 77 (1962).

C. montana subsp. *sinchugica* O. Kuntze, Monogr. Clematis 141 (1885)–Gupta in Bull. Bot. Gard. Lucknow **80**: t. 38 (1963).

C. montana var. *tongluensis* Brühl in Ann. Bot. Gard. Calc. **5**: 74 (1896).

NEPAL. Shewaden, 2600 m (Jun. 29, 1972, no. 720880, fl).

DARJEELING. Tonglu, 3100 m (Jul. 11 & 12, 1969, fl.; Jul. 30, 1972); Sandakphu–Tonglu, 2900–3100 m (Jul. 21, 1969, fl.).

Distr. E. Himalaya (E. Nepal to Bhutan) and Khasia.

Clematis tortuosa Wall. [Cat. no. 4675 (1831), nom. nud.] ex C.E.O. Fischer in Kew Bull. **1929**: 4 (1929)–Gupta in Bull. Bot. Gard. Lucknow **54**: t. 17 (1961)–Kapoor in Bull. Bot. Gard. Lucknow **78**: 52(1962).

C. vitifolia Wall., Cat. no. 4676 (1831), nom. nud.

C. Buchananiana DC. var. *tortuosa* Hook. f. et Thoms. et var. *vitifolia* Hook. f. et Thoms., Fl. Ind. **1**: 11 (1855); in Fl. Brit. Ind. **1**: 6 (1872).

NEPAL. Thale Bisauma–Tingoang, Kalingchok, 2750–3100 m (Sep. 11, 1970, fr.); Phulchoki, Kathmandu, 2500 m (Jul. 15, 1972, bud); Singum Gompa–Gosainkund, 3200–3800 m (Aug. 23, 1972, fl.); Gopte–Thale Patil, 3500–3200 m (Aug. 26, 1972, no. 721987, fl. light yellow).

DARJEELING. Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972, bud).

Distr. Himalaya (Kashmir to Bhutan), Assam, and N. Burma.

Paroxygraphis sikkimensis W. W. Smith: Fl. E. Himal. 90 (1966); **2**: 30 (1971).

NEPAL. Hile Chok–Ghote, 3600 m (Jun. 12, 1972, no. 720367, fl. ♂ & ♀); Saju Pokhari–Topke Gola, 4300 m (Jun. 16, 1972, fl.).

Distr. E. Himalaya (E. Nepal to Bhutan).

Ranunculus adoxifolius Hand.-Mzt.[1]: Fl. E. Himal. 90 (1966); **2**: 30 (1971).

NEPAL. Topke Gola, 3600 m (Jun. 17 & 19, 1972, no. 723623, fl.); Gosainkund-Surjakund, 4300 m (Aug. 25, 1972, fr.).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972, fr.).

Distr. E. Himalaya (Nepal to Bhutan), N. Assam, and S. Tibet.

Ranunculus cantoniensis DC.: Fl. E. Himal. **2**: 31 (1971).

R. napaulensis DC., Prodr. **1**: 39 (1824), syn. nov.

NEPAL. Thale-Dunche, 2000 m (Jun. 25, 1970, no. 612006, fl.).

Distr. Himalaya (Punjab to NEFA), N. India, Indo-China, China, Korea, and Japan.

Ranunculus ficariifolius Léveillé et Vaniot in Bull. Soc. Bot. France **51**: 289 (1904)-Hand.-Mzt., Symb. Sin. **7**: 298 (1931); in Act. Hort. Gotob. **13**: 163 (1939)-Lauener et Green in Not. Bot. Gard. Edinb. **23**: 588 (1961).

R. microphyllus Hand.-Mzt.: Fl. E. Himal. 91 (1966); **2**: 31 (1971).

NEPAL. Kokim Pokhari-Hati Surde, 3200 m (Jun. 11, 1972, no. 720312, fl.); Hile Chok-Ghopte, 3500 m (Jun. 12, 1972); Topke Gola, 3700 m (Jun. 18, 1972).

DARJEELING. Tonglu-Sandakphu, 2800-3500 m (Jul. 31, 1972).

Distr. Himalaya (Kashmir to Bhutan) and W. & C. China.

Ranunculus pegaeus Hand.-Mzt. in Act. Hort. Gotob. **13**: 141 (1939).

NEPAL. Topke Gola, 3600 m (Jun. 19, 1972, no. 720614, fl. & young fr.); Kipuphu-Topke Gola, 4800-3600 m (Jun. 27, 1972, fl.).

Distr. Himalaya (Punjab to Sikkim), S. Tibet, and W. China.

Our Nepalese specimens agree well with *R. pegaeus* from Yunnan. The flowers are about 6 mm in diameter, and seem to be smaller than those in the original description of *R. pegaeus*, but the isotype (Hand.-Mzt. no. 4526) of *R. pegaeus* at Edinburgh has smaller ovate-oblong petals about 3 mm long and 1.3 mm wide. The plant also resembles *R. hyperboreus* Rottb. subsp. *Arnellii* Scheutz, but has 5 petals.

Ranunculus pseudo-pygmaeus Hand.-Mzt. in Act. Hort. Gotob. **13**: 161, t. 1, f. 14 (1939), ex isotypo.

NEPAL. Chilime Khola, 3800-4100 m (Jul. 3, 1970, no. 670041, fl.); Kokim Pokhari-Hati Surde, 3200 m (Jun. 11, 1972, no. 720313, fl.); Banduke Pokhari-Saju Pokhari, 4100 m (Jun. 15, 1972, fl. & fr.); Gosainkund, 4200 m (Aug. 23, 1972, fr.).

Distr. E. Himalaya (Nepal) and W. China.

The Nepalese plants agree well with *R. pseudo-pygmaeus* from W. China, and the species is very closely allied to *R. adoxifolius*.

Ranunculus tricuspis Maxim., Fl. Tangut. 12 (1889); Enum. Pl. Mongol. 16, t. 4, f. 17-27 (1889), ex isotypo.

R. Cymbalariae Pursh var. *alpinus* Hook. f. et Thoms., Fl. Ind. **1**: 32 (1855), p.p.

R. Cymbalariae Pursh sensu Hook. f., Fl. Brit. Ind. **1**: 17 (1872), p.p.

Halerpestes tricuspis (Maxim.) Hand.-Mzt. in Act. Hort. Gotob. **13**: 135 (1940)-

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[1] SIKKIM. Changu, 11000 ft. (W. W. Smith, Jul. 6, 1911, no. 3177. Isotype in Lloyd Bot. Gard. Darjeeling).

Mukerjee in Bull. Bot. Surv. Ind. **3**: 99 (1962).

Halerpestes salsuginosa Greene var. *incisa* Baranov in Fedde, Rep. **63**: 286, f. 3 (1960).

R. salsuginosus Pallas ex Georgi sensu Hara, Fl. E. Himal. **2**: 32 (1971).

NEPAL. Topke Gola, 3800 m (Jun. 18, 1972, fl.).

Distr. Pamir, Thian-Shan, Himalaya (Kashmir to Bhutan), Tibet, Mongolia, and N. China.

This group has been known to be very variable in the shape and size of leaves and the shape of fruit-heads.

Although variable, *Ranunculus salsuginosus* Pallas ex Georgi generally has roundish ovate or ovate leaves shallowly 3–5-lobed (Fig. 8), ovoid or ellipsoid heads of fruit, and numerous small achenes about 1–1.5 mm long with very short beak. It is distributed in C. Asia, Afghanistan, Kashmir, Tibet, Mongolia, N. China, N. Korea, and Siberia east to Kamtchatka.

Ranunculus tricuspis Maxim. is distinct in having deeply lobed leaves, globose fruit-heads with fewer achenes, and larger (1.5–2 mm long) achenes with recurved style. However, the shape and size of leaves are variable in the species (Fig. 9). Typical *R. tricuspis* from Kansu, Tibet, and Mongolia has leaves very deeply 3-lobed near to the base with narrow lanceolate lobes (Fig. 9 a, b), and the leaves on stolon are also deeply 3-lobed. A specimen from Kansu (Purdom, K) has deeply 3–5-lobed leaves, and similar specimens are found also from Bhutan and Nepal. Also the size and shape of leaves are influenced by ecological conditions of the habitat. The plants growing in spring or pool, for example, specimens from Bhutan (Ludlow & Sherriff no. 16645 BM; Kanai et al. no. 21903 TI) and Tibet (Ludlow, Sherriff &Taylor no. 4655 BM), have larger shallowly 3-lobed leaves (Fig. 9 k, l), approaching to those of *R. salsuginosus*. A sterile specimen collected in water, below Kawa in Kali Valley, W. Nepal (Duthie no. 6321, BM) with elongate petioles and shallowly 3-lobed leaves is probably the same form.

Another form from Tibet, Punjab, Ladak and Pamir named as *R. lancifolius* Bertol. has thick narrow leaves which are shallowly 3-lobed or entire (Fig. 9, q–v),

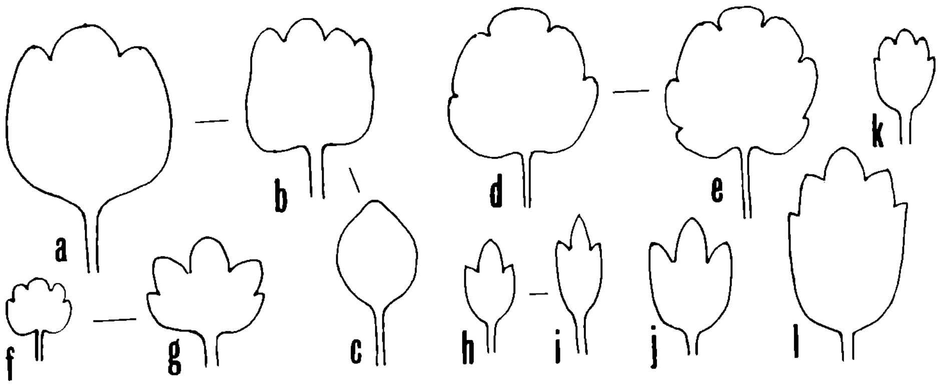

Fig. 8. Variations in leaves of *Ranunculus salsuginosus* Pallas ex Georgi × 1.5. a–c. Kashmir (Clarke 30026B), d,e. Shansi (H. Smith 7361), f, g. Karakorum (O. Polunin 6406), h, i. Irkutsk (Augustinovitz), j. Peiping (Y. Yabe), k. (Kar. et Kiril. 547), l. Mongolia (J. Ohwi).

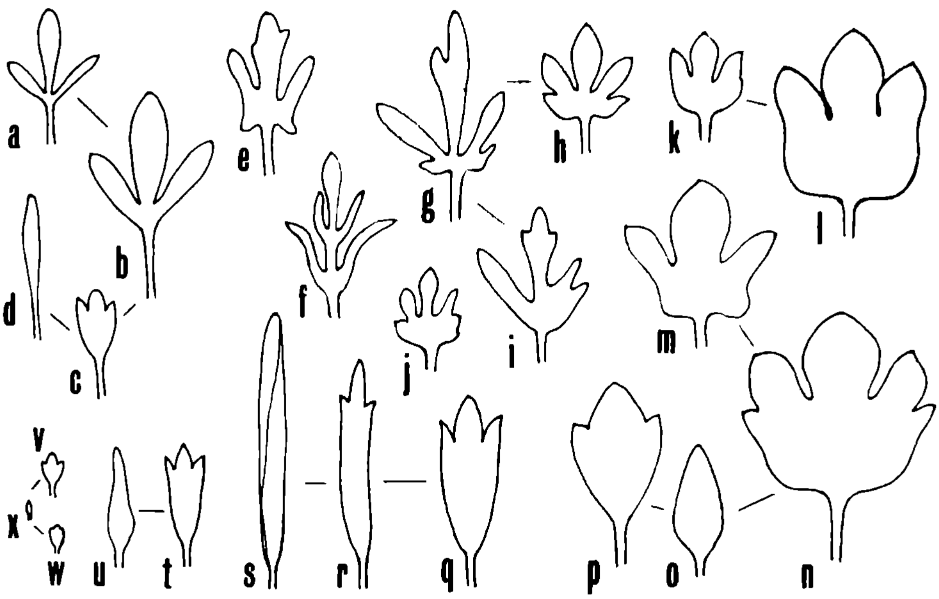

Fig. 9. Variations in leaves of *Ranunculus tricuspis* Maxim. × 1.5. a–d. Kansu (Przewalski, isotype of *R. tricuspis*), e. Kansu (Purdom), f. S. Tibet (Gould 2196), g–i. Bhutan (Ludl. & Sher. 16670), j. Naini Tal (Miss Benham), k, l. S.E. Tibet (Ludl., Sher. & Tayl. 4655), m–p. Bhutan (Ludl. & Sher. 20466), q–s. W. Tibet (T. Thomson, type of *R. palifolius*), t, u. N. Tibet (Deasy 90), v–x. Pamir (Alcock 17674).

but agrees with *R. tricuspis* in the characters of fruit-head and achene. In this form too, the shape and size of leaves are very variable, and occasionally two different forms are mixed in one collection. Even a syntype specimen (the lectotype) of *R. palifolius* from W. Tibet (Mulra Valley, 10000 ft., Thomson, K) includes 3 plants with deeply lobed leaves like *R. tricuspis* (Fig. 9 e). On the other hand, in an isotype specimen of *R. tricuspis* from Kansu: Regio Tangut (Przewalski, 1880, K), some outer leaves are shallowly 3-lobed and rarely lanceolate and entire (Fig. 9 c, d) as in *R. lancifolius*. So I wish to treat *R. lancifolius* as a variety of *R. tricuspis*1).

Thalictrum alpinum L., Sp. Pl. ed. 1, 545 (1753)–Fl. Brit. Ind. **1**: 12 (1872)–Lecoyer, Monogr. Thalictrum 118 (1885)–Hand.-Mzt., Symb. Sin. **7**: 311 (1931); in Act. Hort. Gotob. **13**: 172 (1940)–Boivin in Rhodora **46**: 353 (1944)–Hara in Journ. Fac. Sci. Univ. Tokyo **6** (2): 54 (1952)–Hultén, Amphi-Atlant. Pls. 238, map 220 (1958)–Mukerjee in Bull. Bot. Surv. Ind. **2**: 99 (1960).

var. **minutissimum** Hara, var. nov.

Differt a typo foliis 3–4-ternatis profunde dissectis, segmentis ultimis obovatis minutissimis ca. 1 mm longis glabris, pedunculis filiformibus suberectis, antheris apiculatis, filamentis minutissime scabris, ovariis subsessilibus.

NEPAL. Gosainkund, 4000 m (Kanai, Hara & Ohba, Aug. 24, 1972, fl., no. 723351.

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1) *Ranunculus tricuspis* var. **lancifolius** (Bertol.) Hara, comb. nov.
R. lancifolius Bertoloni in Mem. Acad. Sci. Bologna, ser. 2, **3** (4): 423, t. 6 (1864).
R. palifolius Dunn in Kew Bull. **1925**: 280 (1925), e typo.
Halerpestes lancifolia (Bertol.) Hand.-Mzt. in Act. Hort. Gotob. **13**: 136 (1940).

Holotype in TI); Langtang, 12500–16500 ft. (O. Polunin, Jun. 1949, nos. 189, 220 & 642, fl., BM).

This is an extreme form having very finely dissected leaves with very small obovate ultimate segments only 1 mm long.

Thalictrum alpinum is widely distributed in the arctic-alpine regions of the Northern Hemisphere, and has been known as a variable species (Hara 1952). It is noteworthy that the species seems to show the widest range of variations in the Himalayas. Handel-Mazzetti (1931) noticed that some plants from Himalaya as well as China have long-stalked achenes, and referred them to his var. *microphyllum.* Later Boivin (1944) included all the Sino-Himalayan material in var. *stipitatum* Yabe, but the situation is not so simple.

Some Himalayan plants are almost indistinguishable from typical European *Thalictrum alpinum* having roundish coarsely lobed leaves, recurved shorter fruiting peduncles, sessile or short-stalked achenes, minutely apiculate anthers 1.3–2 mm long, and smooth filaments. However, the Himalayan plants tend to have longer filiform peduncles, longer (2–2.5 mm) anthers long-cuspidate at the apex, and very minutely scabrous filaments.

Thalictrum acaule Jacquem.1) was named to a form from W. Himalaya with erect straight fruiting peduncles and sessile achenes, and the same form occurs also in Garhwal, Sikkim, Tibet, and W. China (Yunnan, Kansu), and probably some specimens from Nepal belong to this form.

The specimen from N. W. Himalaya (Herb. Royle in K) of *T. microphyllum* Royle has flowers with short-stalked ovaries and small deeply lobed leaflets about 2 mm long. But Handel-Mazzetti (1931) applied the name, var. *microphyllum* (Royle) Hand.-Mzt. to the Sino-Himalayan form which has long-stalked (1–2.5 mm long) achenes with a stalk often as long as the achene-body. The variety in the sense of Hand.-Mzt. is found in Himalaya (Kashmir, Punjab, Kumaon), W. Tibet and W. China (Yunnan, Szechuan). All the specimens from Nepal and Bhutan are lacking ripe fruits, and it is difficult to confirm which varieties occur in these regions. *Thalictrum marginatum* Royle (1834) and *T. bracteifilum* Bertoloni (1864), both described from W. Himalaya, are also based on flowering material.

Besides the forms above mentined, one variety, var. *acutilobum*, is characteristic in having acutish lobes of leaves which have scattered soft hairs beneath and also small horn-like appendages on nerves on the lower surface2).

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1) *Thalictrum alpinum* L. var. **acaule** (Jacquem. ex Cambess.) Hara, comb. nov.
T. acaule Jacquem. ex Cambess. in Jacquem., Voy. Ind. **4**: 3, t. 1A (1844).

2) *Thalictrum alpinum* var. **acutilobum** Hara, var. nov.

Differt a typo foliolis saepe profunde lobatis infra molliter pilosis et ad venas parce corniculato-setosis, lobis 2–10 mm longis saepe margine anguste recurvatis subacutis, pedicellis filiformibus 7–25 mm longis vulgo ascendentibus, antheris lineari-oblongis 2–3 mm longis distincte apiculatis, filamentibus minutissime scabris, ovariis subsessilibus.

NEPAL. Lete, Kali Gandaki, 11000 ft. (Stainton, Sykes & Williams, Jun. 9, 1954, no. 1044, fl. Holotype in BM); Tukucha, Kali Gandaki, 10500 ft. (S. S. & W., Jun. 13, 1954, no. 1100, BM, TI); Lanjung Himal, 15000 ft. (S. S. & W., Jul. 14, 1954, no. 6348, BM); Sang Khola, 14000 ft. (S. S. & W., Jun. 24, 1954, no. 3242, E).

BHUTAN. Shingbe, Me La, 15000 ft. (Ludlow, Sherriff & Hicks, Jun. 29, 1949, no. 20419, BM).

BURMA-TIBET FRONTIER. Adung Valley, 12-13000 ft. (K.-Ward, Jul. 14, 1931, no. 9804, BM); Seinghku Wang, 11-12000 ft. (K.-Ward, Jun. 26, 1927, no. 6995, K).

Thalictrum Chelidonii DC., Prodr. **1**: 11 (1824)–Fl. Brit. Ind. **1**: 11 (1872)–Lecoyer, Monogr. Thalictrum 110 & 185 (1885)–Mukerjee in Bull. Bot. Surv. Ind. **2**: 99 (1960).

T. cysticarpum Wall. [Cat. no. 3714 (1831), nom. nud.] Pl. As. Rar. **2**: 26, t. 129 (1831).

NEPAL. Mangen, 3100 m (Aug. 27, 1972, fl. pale mauve); Khodang Danda–Latsu, 2500–2100 m (Aug. 29, 1972, fl.).

Distr. Himalaya (Kulu to Bhutan).

Thalictrum Punduanum Wall. [Cat. no. 3712 (1831), nom. nud.] Pl. As. Rar. **2**: 26 (1831)–Fl. Brit. Ind. **1**: 13 (1872)–Lecoyer, l.c. 142 & 232 (1885)–Mukerjee, l.c. 100 (1960).

NEPAL. Ramche–Gram, 1800–1900 m (Aug. 20, 1972, fr.); Trisuli Khola, 1900 m (Aug. 22, 1972, fl.).

Distr. Himalaya (Garhwal to Nepal) and Khasia.

Thalictrum rostellatum Hook. f. et Thoms., Fl. Ind. **1**: 15 (1855); in Fl. Brit. Ind. **1**: 12 (1872)–Lecoyer, l.c. 154 & 235 (1885)–Mukerjee, l.c. 101 (1960).

NEPAL. Para Gaon, 2310 m (Jun. 28, 1970, no. 672105).

DARJEELING. Phalut–Ratho Chu, 2800 m (Aug. 4, 1972, fl. & fr.).

Distr. Himalaya (Simla to Bhutan).

Thalictrum saniculaeforme DC.: Fl. E. Himal. 91 (1966).

NEPAL. Dor–Chitre, 2600–2300 m (Jul. 7, 1972, fl.); Khodang Danda–Latsu, 2500–2100 m (Aug. 29, 1972, no. 723331, fr., epiphytic); Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972, fl. & fr.); Bhorlang, 2400 m (Aug. 31, 1972, fr.).

Distr. Himalaya (Simla to Sikkim) and W. China.

LAURACEAE (by Yasuiti Momiyama)

Beilschmiedia Gammieana King ex Hook. f., Fl. Brit. Ind. **5**: 124 (1886).

BHUTAN. Tongsa–Tashiling, 2200–2300 m (Apr. 19, 1967, fr.).

Distr. E. Himalaya (Nepal, Sikkim, Bhutan).

Dodecadenia grandiflora Nees: Momiyama in Fl. E. Himal. 100 (1966).

NEPAL. Phulchoki, 2700 m (Oct. 21, 1970); Makwanpur Garhi–Dunge Garhi, 600–1000 m (Nov. 16, 1970); Khodang Danda–Latsu, 2500–2100 m (Aug. 29, 1972, fr.).

Distr. Himalaya (Kumaon, Nepal) and Burma.

Dodecadenia Griffithii Hook. f., Fl. Brit. Ind. **5**: 181 (1886).

NEPAL. Tinjure Phedi, 2700 m (Jun. 7, 1972, "Tree 8 m high. Young fruit ovoid."); Dor–Chauke, 2600–2900 m (Jun. 7, 1972, fr. juv.); Shewaden–Papung, 2600–2000 m (Jun. 29, 1972, ster., "Tree 5 m high.").

Distr. E. Himalaya (Nepal, Bhutan).

Dodecadenia paniculata Hook. f., Fl. Brit. Ind. **5**: 181 (1886).

NEPAL. Shyaprubensi–Dunche, 1800–2000 m (Jul. 19, 1970, "Fruits conical, bright red.").

Distr. E. Himalaya (Nepal, Sikkim) and Manipur.

Lindera Neesiana (Wall.) Kurz: Fl. E. Himal. 100 (1966); **2**: 38 (1971).

NEPAL. Phulchoki, 2700 m (Oct. 19, 1970, fl.).

DARJEELING. Phalut–Raman, 3600–2100 m (Aug. 4, 1972, fr.).

Lindera pulcherrima (Nees) Bentham ex Hook. f.: Fl. E. Himal. 101 (1966); **2**: 38 (1971).

NEPAL. Phulchoki, 2700 m (Nov. 3, 1970, ster.); Dunche-Singum Gompa, 1900-3200 m (Aug. 22, 1972, fr.).

DARJEELING. Palmajua-Batasi, 2200-2100 m (Aug. 8, 1972, fr.).

Litsea elongata (Wall.) Hook. f.: Fl. E. Himal. 101 (1966); **2**: 39 (1971).

NEPAL. Shewaden-Papung, 2600-2000 m (Jun. 29, 1972, bud).

Litsea oblonga (Wall. ex Nees) Hook. f., Fl. Brit. Ind. **5**: 168 (1886).

Tetranthera oblonga Wall. [Cat. no. 2542 (1830), nom. nud.] ex Nees in Wall., Pl. As. Rar. **2**: 67 (1831); Syst. Laur. 551 (1836).

Cylicodaphne oblonga (Wall. ex Nees) Meisn. in DC., Prodr. **15** (1): 205 (1864).

NEPAL. Tingoang-Harjung, 2000 m (Apr. 18, 1970, "Fr. acorn-shaped, dark green with bright dots. Tree 10 m."); Chitlang-Thankot, 2200-1500 m (Sep. 4, 1970, ster.); Phulchoki, 2700 m (Nov. 3 & 4, 1970).

Distr. E. Himalaya (Nepal, Sikkim) and Khasia.

Litsea salicifolia (Roxb.) Hook. f.: Fl. E. Himal. **2**: 39 (1971).

L. oblonga Wall. ex Hook. f. sensu Momiyama in Fl. E. Himal. 102 (1966).

SIKKIM. Gangtok, Orchid Sanctuary, 1500 m (Mar. 18, 1963, bud); Middle Camp, Singtam-Gangtok, 700 m (Mar. 29, 1963, fl. ♂).

Distr. Himalaya (Nepal, Sikkim), Oudh, Assam, Bengal, Chittagong, and Pegu.

Litsea sericea (Wall.) Hook. f.: Fl. E. Himal. 102 (1966); **2**: 39 (1971).

DARJEELING. Tonglu-Sandakphu, 2800-3600 m (Jul. 31, 1972, fr.); Phalut-Raman, 3600-2100 m (Aug. 4, 1972, fr.).

Machilus Duthiei King ex Hook. f.: Fl. E. Himal. 102 (1966); **2**: 39 (1971).

NEPAL. Phulchoki, Kathmandu, 1970 m (Oct. 21, 1970); Phulchoki, 2700 m (Nov. 3, 1970).

Machilus Gammieana King ex Hook. f.: Fl. E. Himal. **2**: 39 (1971).

NEPAL. Shewaden-Papung, 2600-2000 m (Jun. 29, 1972).

DARJEELING. Palmajua-Batasi, 2200-2100 m (Aug. 8, 1972, fr.).

Machilus odoratissima Nees: Fl. E. Himal. **2**: 39 (1971).

NEPAL. Thale-Dunche, 1900-2000 m (Jun. 25, 1970).

Neolitsea Cuipala (D. Don) Kosterm. in Bull. Bot. Surv. Ind. **10**: 287 (1969), in obs.-Momiyama et Hara in Hara in Journ. Jap. Bot. **47**: 269 (1972).

Tetranthera Cuipala D. Don, Prodr. Fl. Nepal. 65 (1825), e typo.

N. lanuginosa (Nees) Gamble: Fl. E. Himal. 102 (1966).

Neolitsea pallens (D. Don) Momiyama et Hara in Journ. Jap. Bot. **47**: 269 (1972).

Tetranthera pallens D. Don, Prodr. Fl. Nepal. 66 (1825), e typo.

T. consimilis Nees in Wall., Pl. As. Rar. **2**: 64 (1831).

Litsea umbrosa var. *consimilis* (Nees) Hook. f., Fl. Brit. Ind. **5**: 180 (1886).

N. umbrosa (Nees) Gamble sensu Momiyama in Fl. E. Himal. 102 (1966).

NEPAL. Para Gaon-Khirojet, 2200-2300 m (Jun. 28, 1970, fr. juv.); Yatumbal-Tangjet, 2700-1800 m (Jul. 8, 1970, fr. juv.); Dunche-Singum Gompa, 1900-3200 m (Aug. 22, 1972, fr.).

Phoebe lanceolata (Nees) Nees: Fl. E. Himal. 103 (1966); **2**: 40 (1971).

NEPAL. Phulchoki, 2700 m (Oct. 20, 1970, ster.).

PAPAVERACEAE (by Hiroshi Hara)

Meconopsis discigera Prain in Ann. Bot. **20**: 356, t. 24, f. 12 (1906)–G. Taylor, Account Meconopsis 108, t. 28 (1934). [Plate 3b]

NEPAL. Samdan, 4400 m (Jun. 24, 1972, fl. pale yellow); Kipuphu–Phujeng La, 4700 m (Jun. 27, 1972, fl. cream yellow).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

Meconopsis grandis Prain in Journ. Asiat. Soc. Beng. **64**: 320 (1896)–Stapf in Bot. Mag. t. 9304 (1933)–G. Taylor, l.c. 68, t. 16 (1934).

NEPAL. Saju Pokhari–Topke Gola, 3800 m (Jun. 16, 1972, fl.); Topke Gola, 3600–3800 m (Jun. 18, 1972, fl.); Lama Chungbu-Samdan, 4300 m (Jun. 24, 1972, fl.); Thudam–Kipuphu, 3400–4500 m (Jun. 26, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

Meconopsis horridula Hook. f. et Thoms., Fl. Ind. **1**: 252 (1855); in Fl. Brit. Ind. **1**: 118 (1872)–G. Taylor, l.c. 91, t. 24 (1934). [Plate 3a]

NEPAL. Jalang Chhyongo–Thudam, 4200–4600 m (Jun. 21, 1972, fl. blue); Gosainkund, 4000–4400 m (Aug. 24, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan), S. Tibet, N. Burma, and W. China.

Meconopsis lyrata (Cummins et Prain ex Prain) Fedde ex Prain in Kew Bull. **1915**: 142 (1915)–G. Taylor, l.c. 73 (1934).

Cathcartia lyrata Cummins et Prain ex Prain in Journ. Asiat. Soc. Beng. **64**: 325 (1896)–Fedde in Pfl.-reich IV-104, Ht. **40**: 246, f. 33E (1909).

C. polygonoides Prain, l.c. 326 (1896); in Ann. Bot. Gard. Calc. **9** (1): 6, t. 8 (1901).

DARJEELING. Phalut, 3600 m (Aug. 2 & 3, 1972, fl. mauve).

Distr. E. Himalaya (Nepal, Sikkim), S. Tibet, and W. China.

Meconopsis paniculata (D. Don) Prain in Journ. Asiat. Soc. Beng. **64**: 316 (1896)–G. Taylor, l.c. 39, t. 7 (1934).

Papaver paniculata D. Don., Prodr. Fl. Nepal. 197 (1825), p.p.

M. nepalensis DC. sensu Hook. f., Ill. Himal. Pl. t. 9 (1855); in Bot. Mag. t. 5585 (1866), ut *Nipalensis.*

NEPAL. Saju Pokhari, 4000 m (Jun. 16, 1972, fl. yellow).

Distr. E. Himalaya (Nepal to NEFA).

CRUCIFERAE (by Hiroshi Hara)

Arabis pterosperma Edgew. in Trans. Linn. Soc. **20**: 33 (1846)–O. E. Schulz in Notizbl. **9**: 1063 (1927)–Jafri in Not. Bot. Gard. Edinb. **22**: 98 & 99 (1956).

Arabis alpina L. sensu Hook. f. et Anderson in Fl. Brit. Ind. **1**: 135 (1872).

Arabidopsis mollissima N. Busch sensu Hara, Fl. E. Himal. **2**: 42 (1971).

Distr. Himalaya (Kashmir to Bhutan).

Braya oxycarpa Hook. f. et Thoms. in Journ. Linn. Soc. **5**: 169 (1861).

Aphragmus oxycarpus (Hook. f. et Thoms.) Jafri: Fl. E. Himal. **2**: 41 (1971).

NEPAL. Jalang Chhyongo, 4300 m (Jun. 21, 1972, fl.); Lama Chungbu, 4400 m (Jun. 23, 1972).

Distr. C. Asia, Afghanistan, Himalaya (Kashmir to Bhutan), Tibet, and W. China.

Chrysobraya glaricola Hara in Journ. Jap. Bot. **49**: 195, f. 1 (1974).

NEPAL. Jalang Chhyongo, 4100 m (Jun. 20, 1972, no. 720631, fl. yellow).

Distr. E. Himalaya (Nepal, Bhutan).

The genus *Chrysobraya* is well characterized in having linear subterete siliquae with uniseriate seeds, incumbent radicle, 4 separate clavate nectariferous glands without median ones, persistent sepals, yellow flowers, more or less obovate leaves generally with 3–5 coarse teeth, and long tree-like hairs up to the ovary.

Draba oreades Schrenk in Fischer et Meyer, Enum. Pl. Nov. **2**: 56 (1842)-O. E. Schulz in Pfl.-reich IV-105, Ht. **89**: 106 (1927), incl. var. *commutata* (E. Regel) O. E. Schulz, prol. *alpicola* (Klotz.) O. E. Schulz, et var. *occulta* O. E. Schulz.

D. alpicola Klotzsch, Bot. Ergebn. Res. Prinz Waldem 128, t. 34A (1862).

D. alpina L. sensu Hook. f. et Anderson in Fl. Brit. Ind. **1**: 142 (1872).

NEPAL. Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972, fr.); Jalang Chhyongo–Thudam, 4300 m (Jun. 21, 1972, fl. yellow); Kipuphu, 4500 m (Jun. 26 1972, fl.); Kipuphu–Topke Gola, 4500–3600 m (Jun. 27, 1972, fl.).

Distr. C. Asia, Altai, Himalaya, Tibet, Mongolia, and W. China.

This species is especially variable in the hairiness and the shape of silicles.

Eutrema heterophyllum (W. W. Smith) Hara in Journ. Jap. Bot. **48**: 97 (1973).

Braya heterophylla W. W. Smith in Not. Bot. Gard. Edinb. **11**: 201 (1919).

NEPAL. Jalang Chhyongo–Thudam, 4600–3400 m (Jun. 21, 1972, fl. & young fr.).

BHUTAN. Lingshi-Yale La-Shodu, 4400 m (May 23, 1967, fl.).

Distr. E. Himalaya (Nepal, Bhutan), S. Tibet, and W. China.

Lignariella Hobsonii (Pearson) Baehni in Candollea **15**: 57 (1955), ut *Hobsoni*-Jafri in Candollea **16**: 134, f. 16 & 18 (1957).

Cochlearia Hobsoni Pearson in Hook., Icon. Pl. t. 2643 (1900).

subsp. **serpens** (W. W. Smith) Hara, comb. nov.

Cochlearia? serpens W. W. Smith in Rec. Bot. Surv. Ind. **4**: 175 (1911).

Lignariella Hobsoni Baehni: Fl. E. Himal. 109 (1966), p.p.

L. obscura Jafri, l.c. 132 & 134, f. 17 & 19 (1957), excl. basionym et syn.

NEPAL. Banduke Pokhari, 4100 m (Jun. 15, 1972, fl. lilac); Saju Pokhari–Topke Gola, 4400–3600 m (Jun. 16, 1972, fl.); Kipudonsu–Kipuphu, 4300 m (Jun. 26, 1972, fl. violet).

Distr. Himalaya (Kashmir to Bhutan).

Jafri (1957) distinguished two species in the genus *Lignariella*. Typical *L. Hobsonii* has slender styles (2.5–)3–4 mm long, while the other is generally smaller in all respects, and has short styles 1–1.5(–1.8) mm long. However, intermediate forms rarely occur, and I wish to treat the latter as a subspecies of *L. Hobsonii*. On examination of the type of *Draba obscura* Dunn at Kew, I noticed, contrary to expectation, that *Aphragmus obscurus* (Dunn) O. E. Schulz is quite a different plant from *Lignariella*.

Loxostemon pulchellus Hook. f. et Thoms.: Fl. E. Himal. 109 (1966).

NEPAL. Banduke Pokhari–Saju Pokhari, 4200–4000 m (Jun. 15, 1972, fl.); Saju Pokhari (Jun. 16, 1972, fl.); Kipuphu–Topke Gola, 4800-3600 m (Jun. 27, 1972).

Distr. E. Himalaya (Nepal to Bhutan), S. Tibet, and W. China.

Pegaeophyton minutum Hara in Journ. Jap. Bot. **47**: 270, f. 2 (1972).

NEPAL. Mul Kharka, Chilime Khola, 4100 m (Jul. 3, 1970, no. 672270).

SIKKIM. Oma La–Migothang, 4200 m (May 30, 1960, no. 6344. Holotype in TI).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

Thlaspi cochlearioides Hook. f. et Thoms. in Journ. Linn. Soc. **5**: 177 (1861)–Fl. Brit. Ind. **1**: 162 (1872)–O. E. Schulz in Notizbl. **9**: 1095 (1927).

NEPAL. Jalang Chhyongo–Janga La, 4400 m (Jun. 21, 1972, no. 720639, fl. & young fr.).

Distr. Himalaya (Kashmir to Sikkim).

PODOSTEMACEAE (by Hiroo Kanai)

Hydrobrium Griffithii (Wall.) Tulasne: Hara, Fl. E. Himal. 110 (1966); **2**: 45 (1971).

NEPAL. Budhanilkantha, 1500 m (Dec. 31, 1969); Thunnai, 1900 m (Sep. 30, 1970); Rol Khane–Barabise, 2000 m (Oct. 1, 1970).

The collection at Budhanilkantha is the first record of this plant in Kathmandu Valley. Its habitat seems to be fluctuating year by year influenced by the amount of running water. It was not found in the same place in December 1963 in spite of our special attention to it. In 1969, the rainfall was higher than usual years.

CRASSULACEAE[1] (by Hideaki Ohba)

***Sedum bupleuroides** Wall. ex Hook. f. et Thoms.: Hara, Fl. E. Himal. **2**: 41 (1971). [Plate 3c]

S. elongatum Hook. f. et Thoms.: Fl. E. Himal. **2**: 41 (1971).

NEPAL. Gotiora–Gadje, 3300 m (Aug. 25, 1969, fr.); Yatumbal–Oo Kharka, 3100 m (Jun. 30, 1970, fl.); Lukthang–Kalingchok, 3400 m (Sep. 28, 1970, fr.); Hile Chok–Ghopte, 3500 m (Jun. 12, 1972); Topke Gola, 3600 m (Jun. 19, 1972, fl.); Topke Gola–Jalang Chhyongo, 3800 m (Jun. 20, 1972, fl.); Thudam–Lama Chungbu, 3600 m (Jun. 23, 1972, fl.); Thudam–Kipudonsu, 4000 m (Jun. 26, 1972, fl.); Phujeng La–Topke Gola, 3800 m (Jun. 27, 1972, fl.); Topke Gola–Shewaden, 3150 m (Jun. 28, 1972, fl.); Thale–Dunche, 2000 m (Aug. 21, 1972, fl. & fr.); Trisuli Khola–Singum Gompa, 2200 m (Aug. 22, 1972, fr.); Gosainkund, 4000 m (Aug. 24, 1972, fr.); Gosainkund–Surjakund, 4350 m (Aug. 25, 1972, fl. & fr.); Surjakund–Gopte, 3650 m (Aug. 25, 1972, fr.); Gopte–Thale Patil, 3200 m (Aug. 26, 1972, fr.); Thale Patil–Hile Dhap, 3400 m (Aug. 27, 1972).

Distr. E. Himalaya (Nepal to Bhutan), Tibet, and W. China.

***Sedum crenulatum** Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 96 (1858)–C. B. Clarke in Fl. Brit. Ind. **2**: 417 (1878). [Plate 11]

BHUTAN. Lingshi–Shodu, 4500 m (May 23, 1967, young fl.).

Distr. E. Himalaya (Nepal, Sikkim, and Bhutan), Tibet, and W. China (Yunnan).

***Sedum Cretinii** R.-Hamet in Journ. Bot. **54**: suppl. 16 (1916).

S. Wallichianum Hook. var. *Cretinii* (R.-Hamet) Hara, Fl. E. Himal. 108 (1966).

NEPAL. Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972, fl.); Topke

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[1] Species with an asterisk are treated in detail on pages 283–362.

Gola–Jalang Chhyongo, 4300 m (Jun. 20, 1972, fl.); Lama Chungbu–Samdan, 4300 m (Jun. 24, 1972, fl.); Thudam–Kipudonsu, 3850 m (Jun. 26, 1972, fl.).

Distr. E. Himalaya (Nepal, Sikkim, and Bhutan) and S. Tibet.

***Sedum discolor** Franchet in Journ. de Bot. **10**: 285 (1896).

S. tibeticum Hook. f. et Thoms. sensu Praeger in Journ. Roy. Hort. Soc. **46**: 49, fig. 17 (1921).

NEPAL. Gosainkund, 4200–4400 m (Aug. 27, 1969, fr.; Aug. 23, 1972, fr.); Mul Kharka, Chilime Khola, 3800–4100 m (Jul. 3, 1970, fl.); Saju Pokhari, 4000 m (Jun. 15, 1972, fl.); below Jalang Chhyongo, 3900 m (Jun. 20, 1972, fl.); Thudam–Lama Chungbu, 4000 m (Jun. 23, 1972, fl.); Kipudonsu–Kipuphu, 4400 m (Jun. 26, 1972, fl.).

SIKKIM. Along Choktsering Chu, N. of Jongri, 4000–4500 m (May 25, 1960, fl.); Migothang, 3900 m (May 31, 1960, fl.).

Distr. E. Himalaya (Nepal and Sikkim) and W. China (Yunnan).

***Sedum fastigiatum** Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 98 (1858)–C. B. Clarke in Fl. Brit. Ind. **2**: 419 (1878).

NEPAL. Mul Kharka, Chilime Khola, 4100 m (Jul. 4, 1970, fl.); Banduke Pokhari, 4200 m (Jun. 14, 1972, fl.); Saju Pokhari–Topke Gola, 4200 m (Jun. 16, 1972, fl.); Jalang Chhyongo, 4300 m (Jun. 20, 1972, fl.); Kipudonsu–Kipuphu, 4300 m (Jun. 26, 1972, fl.); Kipuphu–Phujeng La, 4500–4800 m (Jun. 27, 1972, fl.); Singum Gompa–Gosainkund, 4200 m (Aug. 23, 1972, fl.); Gosainkund, 4200 m (Aug. 24, 1972, fl.); Gosainkund–Surjakund, 4200 m (Aug. 25, 1972, fl.).

SIKKIM. Jongri–Olothang (May 23, 1960, ster.); Oma La–Migothang (May 30, 1960); Migothang, 3800 m (May 31, 1960, fl. bud).

Distr. E. Himalaya (Nepal and Sikkim), Tibet, and N. W. China.

***Sedum himalense** D. Don: Fl. E. Himal. 107 (1966).

NEPAL. Mul Kharka, Chilime Khola, 4100 m (Jul. 3, 1970, fl.); Ghopte–Gosa, 3700–4100 m (Jun. 13, 1972, fl.); Gosa–Banduke Pokhari, 4100–4200 m (Jun. 15, 1972, fl.); Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972, fl.); Saju Pokhari–Topke Gola, 4300–3700 m (Jun. 16, 1972, fl.); Topke Gola, 3600 m (Jun. 19, 1972, fl.); Janga La–Thudam, 4200–3400 m (Jun. 21, 1972, fl.); Thudam–Lama Chungbu, 3400–4200 m (Jun. 23, 1972, fl.); Lama Chungbu–Samdan, 4200–4400 m (Jun. 24, 1972, fl.); Thudam–Kipudonsu, 3400–4200 m (Jun. 26, 1972, fl.); Phujeng La–Topke Gola, 3800 m (Jun. 27, 1972, fl.); Gosainkund, 4000 m (Aug. 24, 1972, fl. & fr.).

BHUTAN. Laya–Laum Thang, 3800 m (May 18, 1967); Laum Thang–Chawa Gassar, 4700 m (May 19, 1967, fr.).

Distr. E. Himalaya (Nepal, Sikkim, and Bhutan), Tibet, and N. W. China.

***Sedum linearifolium** Royle, Ill. Bot. Himal. 222, t. 48, f. 1 (1835)–Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 100 (1858)–C. B. Clarke in Fl. Brit. Ind. **2**: 420 (1878)–R.-Hamet in Act. Hort. Gothob. **2**: 394 (1926), excl. var. *ovatisepalum*, var. *Balfouri*, var. *Tieghemi*, var. *Dielsianum* et var. *sacrum*. [Plate 3d]

S. pauciflorum Edgew. in Trans. Linn. Soc. **20**: 49 (1846)–Hook. f. et Thoms., l.c. 100 (1858).

S. trifidum Wall. [Cat. no. 7230 (1832), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 100 (1858)–C. B. Clarke in Fl. Brit. Ind. **2**: 420 (1878).

NEPAL. Thale–Thale Bisauna, 2600 m (Sep. 10, 1970, fl.); Thale Bisauna–Tingoang, 2750–3100 m (Sep. 11, 1970, fl.); Tinjure–Tinjure Phedi, 2900 m (Jun. 7, 1972, fr.);

Singum Gompa–Gosainkund, 3600 m (Aug. 23, 1972, fl.); Gopte–Thale Patil, 3300 m (Aug. 26, 1972, fl.).

Distr. Himalaya (Kashmir, Lahore, Kumaon, and Nepal).

Sedum multicaule Wall. ex Lindl.: Fl. E. Himal. 107 (1966).

NEPAL. Khanging–Lantang Gorge, 2300–2800 m (Jul. 11, 1970, fl.); Shyaprubensi–Dunche, 1500–2000 m (Jul. 19, 1970, fl.); Chitlang–Thankot, 2100 m (Sep. 4, 1970, fl.); Mewa Khola–Papung, 2100 m (Jun. 29, 1972, ster.); Ramche–Gram, 1800 m (Aug. 20, 1972, fl.); Thale–Dunche, 1860 m (Aug. 21, 1972, fl.); Dunche, 2000 m (Aug. 22, 1972, fl.).

***Sedum ovatisepalum** (R.-Hamet) H. Ohba, stat. nov.

S. linearifolium Royle var. *ovatisepalum* R.-Hamet in Act. Hort. Gothob. **2**: 394 (1926): Fl. E. Himal. 107 (1966).

DARJEELING. Kala Pokhari–Sandakphu, 3200 m (Jul. 31, 1972, bud); Sandakphu, 3600 m (Aug. 1, 1972, fl.); Sandakphu–Sabargam, 3200–3600 m (Aug. 2, 1972, fl.); Phalut, 3600 m (Aug. 3, 1972, fl.).

BHUTAN. Tzatogang–Dotanang, 3000 m (May 27, 1967, ster.).

Distr. E. Himalaya (Nepal, Sikkim, and Bhutan), Tibet, and N. W. Burma.

***Sedum quadrifidum** Pallas, Reise **3**: 730, t. 6, fig. 1 (1776)–Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 97 (1858), cum obs. et incl. var. *α–ε*, e.g. *scoparium*–C. B. Clarke in Fl. Brit. Ind. **2**: 418 (1878).

NEPAL. Gosainkund, 4200 m (Aug. 25, 1972).

Distr. C. Asia, Himalaya, Tibet, N. W. China, Mongol, Siberia, and Eurasic Arctic Circle.

***Sedum sacrum** (R.-Hamet) H. Ohba in Journ. Jap. Bot. **49**: 321 (1974).

S. linearifolium Royle var. *sacrum* R.-Hamet in Act. Hort. Gothob. **2**: 395 (1926).

NEPAL. Singum Gompa, 3000 m (Jun. 4, 1969; Aug. 22, 1972, fl.); Phulchoki, 2600 m (Aug. 9, 1969; May 28, 1972; Jul. 15, 1972, young fl.).

Distr. E. Himalaya (Nepal) and Tibet.

Sedum Triactina Berger: Fl. E. Himal. 107 (1966); **2**: 41 (1971).

S. verticillatum R.-Hamet in Rev. gen. Bot. **55**: 92 (1913).

NEPAL. Near Chauke, 2750 m (Jun. 7, 1972; Jul. 6, 1972, fl.); Topke Gola–Shewaden, 2800 m (Jun. 28, 1972, fl.); Gopte–Thale Patil, 3200 m (Aug. 26, 1972, fl.).

Sedum trullipetalum Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 102 (1858)–C. B. Clarke in Fl. Brit. Ind. **2**: 421 (1878)–R.-Hamet in Bull. Soc. Bot. France **56**: 47 (1909); in Not. Bot. Gard. Edinb. **24**: 118 (1912); in Candollea **4**: 48 (1929)–Praeger in Journ. Roy. Hort. Soc. **46**: 259 (1921)–Fröd. in Act. Hort. Gothob. **6**: app. 43 (1931); in Hand.-Mzt., Symb. Sin. **7**: 410 (1931); in Arkiv för Bot. **30** A (9): 7 (1943)–Weibel in Candollea **16**: 145 (1958).

NEPAL. Gadje–Surjakund, 3900–4450 m (Aug. 26, 1969, fl.); Singum Gompa–Gosainkund, 3600 m (Aug. 23, 1972, fl.).

Distr. Himalaya (Garhwal, Kumaon, Nepal, Sikkim, and Bhutan), Tibet, and N. W. China.

***Sedum Wallichianum** Hook.: Fl. E. Himal. 107 (1966).

NEPAL. Topke Gola, 3600 m (Jun. 28, 1972); Singum Gompa–Gosainkund, 3300 m (Aug. 23, 1972, fl.).

SAXIFRAGACEAE (by Hiroshi Hara)

Parnassia chinensis Franch. in Bull. Soc. Bot. France **44**: 252 (1897), e typo–Nekrassova in Bull. Soc. Bot. France **74**: 650 (1927).

P. mysorensis Heyne sensu Hara, Fl. E. Himal. 115 (1966); **2**: pl. 9a (1971).

NEPAL. Topke Gola, 3600 m (Jun. 17, 1972); Kipuphu, 4500 m (Jun. 26, 1972, no. 720789, fl.).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972, fl.).

Distr. Himalaya (Nepal to Bhutan), S. Tibet, N. Burma, and W. China.

The specimens from Sandakphu agree well with the type specimen of *P. chinensis* from Yunnan.

Parnassia kumaonica Nekrassova in Bull. Soc. Bot. France **74**: 646 (1927)–Hara in Kihara, Fauna Fl. Nepal Himal. 142 (1955).

NEPAL. Janga La–Thudam, 4100 m (Jun. 21, 1972, fl.); Thudam–Lama Chungbu, 3800 m (Jun. 23, 1972, no. 720687, fl. greenish white); Lama Chungbu–Thudam, 4400–3600 m (Jun. 24, 1972, fl.).

Distr. Himalaya (Kashmir to Nepal).

Parnassia pusilla Wall. [Cat. no. 1245 (1829), nom. nud.] ex Arnott in Comp. Bot. Mag. **2**: 315 (1837)–C. B. Clarke in Fl. Brit. Ind. **2**: 403 (1878), p.p.–Nekrassova, l.c. 645 (1927).

P. affinis Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 81 (1857).

P. ovata Ledeb. sensu C. B. Clarke in Fl. Brit. Ind. **2**: 403 (1878), p.p.

P. mysorensis Heyne sensu C. B. Clarke, l.c. 402 (1878), p.p.–Nekrassova, l.c. 648 (1927), p.p.

NEPAL. Topke Gola, 3600 m (Jun. 19, 1972, fl.); Thudam–Lama Chungbu, 3500 m (Jun. 23, 1972, fl.); Lama Chungbu–Thudam, 4400–3400 m (Jun. 24, 1972, fl.); Phujeng La–Topke Gola, 3800 m (Jun. 27, 1972, fl.); Singum Gompa–Gosainkund, 3200–4000 m (Aug. 23, 1972, fl.); Gosainkund–Surjakund, 4000–4400 m (Aug. 25, 1972, fl.); Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972, fl.).

Distr. Himalaya (Garhwal to Sikkim).

I designate the specimen from Gossain Than (Wallich, 1821, no. 1245 KW) of C. Nepal as the lectotype of *P. pusilla*. The specimens of Sikkim collected by Hooker f. in 1849 (K) are generally a mixture of *P. pusilla* and *P. chinensis*. *P. affinis* is a well-grown elongate form of *P. pusilla* sometimes attaining 18 cm high.

Ribes luridum Hook. f. et Thoms.: Fl. E. Himal. 116 (1966).

NEPAL. Saju Pokhari–Topke Gola, 4400–3600 m (Jun. 16, 1972); Jalang Chhyongo–Thudam, 4200–4600 m (Jun. 21, 1972, fl.); Thudam–Kipuphu, 4200–4500 m (Jun. 26, 1972, no. 723107, fl.).

Saxifraga Andersonii Engl.: Fl. E. Himal. **2**: 48 (1971).

NEPAL. Saju Pokhari, 4200 m (Jun. 16, 1972, no. 720540, fl. white); Jalang Chhyongo–Thudam, 4200–4600 m (Jun. 21, 1972, fl.).

Saxifraga Brunonis Wall. ex Seringe in DC., Prodr. **4**: 45 (1830).

S. Brunoniana Wall. [Cat. no. 444 (1828), nom. nud.] ex Sternb., Rev. Saxifr. Suppl. **2**: 25, t. 23 (1831)–Fl. Brit. Ind. **2**: 397 (1878)–Engl. et Irmsch. in Engl., Pfl.-reich IV-117, Ht. **67**: 163 (1916).

NEPAL. Langtang–Kyangjing, 3400–3800 m (Jul. 13, 1970, fl.); Thudam, 3400 m (Jun. 24, 1972, no. 723946, fl.).

Distr. Himalaya (Kumaon to Bhutan) and S. Tibet.

Saxifraga diversifolia Wall. ex Seringe: Fl. E. Himal. 116 (1966).

Nepal. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972, fl.); Gosainkund, 4000–4400 m (Aug. 24, 1972, fl.); Gosainkund–Gopte, 4400–3500 m (Aug. 25, 1972, fl.).

Distr. Himalaya (Kashmir to Bhutan), S. Tibet, and W. China.

Saxifraga flagellaris Willd. in Sternb., Rev. Saxifr. 25, t. 6 (1810).

subsp. **mucronulata** (Royle) Engl. et Irmsch., l.c. 163 (1916).

S. mucronulata Royle, Ill. Bot. Himal. 227, t. 50, f. 2 (1835), fig. ut *S. spinulosa* Royle.

S. flagellaris var. *mucronulata* (Royle) C. B. Clarke in Fl. Brit. Ind. **2**: 397 (1878).

Nepal. Topke Gola–Jalang Chhyongo, 3800 m (Jun. 20, 1972, no. 720621, fl. yellow).

Distr. Himalaya (Kashmir to Bhutan).

Saxifraga Gageana W. W. Smith in Rec. Bot. Surv. Ind. **4**: 265 (1911)–Engl. et Irmsch., l.c. 53 (1916).

Nepal. Gosainkund, 4400 m (Aug. 24, 1972, no. 721907, fl. dark red).

Distr. E. Himalaya (Nepal, Sikkim).

Saxifraga glabricaulis H. Smith in Bull. Brit. Mus. Bot. **2**: 241, f. 7, t. 18A (1960).

S. palpebrata var. *parceciliata* Engl. et Irmsch., l.c. 125 (1916).

Nepal. Topke Gola–Jalang Chhyongo, 4200 m (Jun. 20, 1972, no. 720632, fl. yellow).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

Saxifraga granulifera H. Smith in Bull. Brit. Mus. Bot. **2**: 259, t. 21B (1960).

Nepal. Langtang–Kyangjing, 3500 m (Jul. 13, 1970, no. 672479, fl. white).

Distr. Himalaya (Nepal to Bhutan) and S.E. Tibet.

Saxifraga hispidula D. Don: Fl. E. Himal. 117 (1966).

S. evolvuloides Wall. [Cat. no. 447 (1829), nom. nud.] ex DC., Prodr. **4**: 46 (1830)–Sternb., Rev. Saxifr. Suppl. **2**: 20, t. 23 (1831).

Nepal. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972, fl.); Gosainkund, 4000–4400 m (Aug. 24, 1972, fl.).

Darjeeling. Kala Pokhari–Sandakphu, 3500–3550 m (Jul. 13, 1969, fl.); Mt. Singalila, 3950 m (Jul. 17, 1969, fl.); Sandakphu, 3600–3800 m (Jul. 20, 1969; Aug. 1, 1972, fl.); Gairibas–Sandakphu, 2900–3500 m (Jul. 31, 1972, fl.).

On the Singalila Range, the flowers of this species are generally deep yellow, but some individuals have pale lemon-yellow flowers.

Saxifraga Kingiana Engl. et Irmsch. in Engl., Bot. Jahrb. **48**: 610 (1912); in Engl., Pfl.-reich IV-117, Ht. **67**: 99 (1916).

Nepal. Gosainkund–Gopte, 4200–3500 m (Aug. 25, 1972, fl.); Gopte-Thale Patil, 3500–3200 m (Aug. 26, 1972, no. 723958, fl.).

Distr. Himalaya (Nepal to Bhutan) and S. Tibet.

Saxifraga Lychnitis Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 68 (1857)–Fl. Brit. Ind. **2**: 391 (1878)–Engl. et Irmsch., l.c. 132, f. 30A–M (1916).

Nepal. Samdan, 4400 m (Jun. 24, 1972, no. 720719, fl. yellow).

Distr. Himalaya (Kumaon to Bhutan) and S. Tibet.

Saxifraga microviridis Hara, nom. nov.

S. microphylla (non Schleich. 1821) Royle ex Hook. f. et Thoms. in Journ. Linn.

Soc. **2**: 72 (1857)-Fl. Brit. Ind. **2**: 395 (1878)-Engl. et Irmsch., l.c. 156 (1916).

NEPAL. Mul Kharka, Chilime Khola, 3800–4100 m (Jul. 4, 1970, fl.); Phujeng La, 4800 m (Jun. 27, 1972, no. 720810, fl. green).

Distr. Himalaya (Kashmir, Kumaon, Nepal).

Saxifraga Moorkroftiana Wall. ex Sternb.: Fl. E. Himal. 117 (1966).

NEPAL. Gosainkund, 4000–4400 m (Aug. 24, 1972, fl. yellow).

Distr. Himalaya (Kashmir to Bhutan), S. Tibet, and W. China.

Saxifraga Nakaoi Kitamura in Kihara, Fauna Fl. Nepal Himal. 144, t. 25 (1955).

NEPAL. Kipudonsu–Kipuphu, 4300 m (Jun. 26, 1972, no. 720781, fl. yellow with orange dots in the lower half).

Distr. Nepal.

Saxifraga pallida Wall. ex DC.: Fl. E. Himal. **2**: 49 (1971).

NEPAL. Banduke Pokhari–Saju Pokhari, 4100 m (Jun. 15, 1972, fl.); Lama Chungbu–Thudam, 4400–3400 m (Jun. 24, 1972, fl.); Thudam–Kipuphu, 3500 m (Jun. 26, 1972, fl.); Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972, no. 723970, fl.).

Saxifraga parnassifolia D. Don in Trans. Linn. Soc. **13**: 405 (1821); Prodr. Fl. Nepal. 210 (1825)–Sternb., Rev. Saxifr. Suppl. **2**: 27, t. 25 (1831)–Fl. Brit. Ind. **2**: 393 (1878), p.p.–H. Smith in Bull. Brit. Mus. Bot. **2**: 232, f. 2d-g (1960).

S. diversifolia var. *parnassifolia* (D. Don) Engl., Monogr. Saxifr. 125 (1872)–Engl. et Irmsch., l.c. 129 (1916).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Dunche–Singum Gompa, 2000–3000 m (Aug. 22, 1972, no. 723950, fl. yellow).

Distr. Himalaya (Garhwal to Bhutan).

Saxifraga pseudo-pallida Engl. et Irmsch. in Engl., Bot. Jahrb. **50** (Beibl. 114): 40 (1914); in Engl., Pfl.-reich IV–117, Ht. **67**: 51, f. 8F–O (1916).

S. pallida Wall. sensu C. B. Clarke in Fl. Brit. Ind. **2**: 394 (1878), p.p.

NEPAL. Saju Pokhari–Topke Gola, 4400–3600 m (Jun. 16, 1972, fl.); Lama Chungbu–Samdan, 4300 m (Jun. 24, 1972, no. 720709, fl. white with 2 yellow patches near the base); Thudam, 3400 m (Jun. 26, 1972, fl.); Kipuphu, 4500 m (Jun. 26, 1972, fl.); Kipuphu–Topke Gola, 4800–3600 m (Jun. 27, 1972, fl.).

Distr. Himalaya (Kashmir to Bhutan) and W. China.

Saxifraga saginoides Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 68 (1858)–Fl. Brit. Ind. **2**: 392 (1878)–Engl. et Irmsch., l.c. 121, f. 24 (1916).

NEPAL. Saju Pokhari–Topke Gola, 4400–3600 m (Jun. 16, 1972, fl.); Janga La–Thudam, 4100 m (Jun. 21, 1972, no. 720655, fl.); Lama Chungbu–Thudam, 4200–4500 m (Jun. 24, 1972, fl.); Gosainkund, 4400 m (Aug. 24, 1972, no. 721911, fl. yellow).

Distr. Himalaya (Kumaon to Bhutan), S. Tibet, and W. China.

Saxifraga sphaeradena H. Smith in Bull. Brit. Mus. Bot. **2**: 235, t. 15 B, f. 4 (1960).

NEPAL. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972, fl.); Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972, fl.); Khodang Danda–Latsu, 2500–2100 m (Aug. 29, 1972, fl.).

Distr. Himalaya (Nepal, Sikkim) and S. Tibet.

In our specimens, the sepals have sessile glands on the margin, and they are intermediate between subsp. *sphaeradena* and subsp. *Dhwojii*.

Saxifraga stella-aurea Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 72 (1857)–Engl. et Irmsch., l.c. 155 (1916).

S. Jacquemontiana var. *stella-aurea* (Hook. f. et Thoms.) C. B. Clarke in Fl. Brit. Ind. **2**: 395 (1878).

var. **polyadena** H. Smith in Bull. Brit. Mus. Bot. **2**: 254, f. 15 a–c (1960).

NEPAL. Kipuphu–Phujeng La, 4700 m (Jun. 27, 1972, no. 720806, fl. yellow with minute orange dots).

Distr. Himalaya (Nepal) and S.E. Tibet.

ROSACEAE (by Hiroshi Hara and Hiroyoshi Ohashi)

Eriobotrya elliptica Lindl. in Trans. Linn. Soc. **13**: 102 (1822)–Hook. f., Fl. Brit. Ind. **2**: 372 (1878)–Vidal in Adansonia n.s. **5**: 551 (1965), var. *elliptica*.

Mespilus Cuila Hamilt. ex D. Don, Prodr. Fl. Nepal. 238 (1825), nom. superfl.

NEPAL. Ranga Pani–Ghorwa, 400–500 m (Dec. 9, 1963, no. 6301813, fl.); Godawari–Phulchoki, 1600–2500 m (Jun. 25 & 26, 1967, young fr.).

Distr. Nepal.

Eriobotrya petiolata Hook. f., Fl. Brit. Ind. **2**: 370 (1878)–Vidal, l.c. 552, t. 1, f. 4 (1965).

DARJEELING. 2150 m (Jul. 27, 1969).

BHUTAN. Tongsa–Tashiling, 2200–2300 m (Apr. 19, 1967, bud).

Distr. Himalaya (Sikkim, Bhutan), Assam, and E. India.

Malus sikkimensis (Wenz.) Koehne, Gatt. Pomac. 27 (1890)–C. K. Schneid., Ill. Handb. Laubh. **1**: 719 (1906), in adnota–Rehd., Man. Trees & Shrubs ed. 2, 393 (1940).

Pyrus Pashia var. *sikkimensis* Wenz. in Linnaea **38**: 49 (1874).

P. sikkimensis (Wenz.) Hook. f., Fl. Brit. Ind. **2**: 373 (1878); in Bot. Mag. t. 7430 (1895).

BHUTAN. Thimphu, 2400 m (Apr. 30, 1967, fl.).

Distr. Himalaya (Nepal to Bhutan), Assam, and S. E. Tibet.

Prunus undulata Hamilt. ex D. Don, Prodr. Fl. Nepal. 239 (1825), e typo–Hara in Journ. Jap. Bot. **48**: 97 (1973).

Cerasus acuminata Wall., Pl. As. Rar. **2**: 78, t. 181 (1831).

P. Wallichii Steud.: Hara et Ohashi in Fl. E. Himal. 126 (1966); **2**: 55 (1971).

C. Wallichii (Steud.) M. Roemer, Syn. Monogr. Rosifl. **3**: 81 (1847).

Laurocerasus undulata (D. Don) M. Roemer, l.c. 92 (1847).

P. acuminata f. *Wallichii* (Steud.) Koehne in Engl., Bot. Jahrb. **52**: 296 (1915).

Distr. Himalaya (Nepal to Bhutan), Khasia, N. Burma, N. Thailand, Indo-China, W. & S. China, Malay, and Sumatra.

Prunus venosa Koehne in Sarg., Pl. Wilson. **1**: 60 (1911)–Hara in Journ. Jap. Bot. **48**: 98 (1973).

P. undulata Hamilt. ex D. Don sensu Hook. f., Fl. Brit. Ind. **2**: 316 (1878): Fl. E. Himal. 126 (1966); **2**: 55 (1971).

P. undulata f. *venosa* (Koehne) Koehne, l.c. 285 (1915).

Distr. Himalaya (Kumaon to Bhutan), Khasia, S. Tibet, and W. & C. China.

Rubus alexeterius Focke in Not. Bot. Gard. Edinb. **5**: 75, t. 67 (1911), e typo.

R. acaenocalyx Hara in Journ. Jap. Bot. **47**: 109, f. 1 (1972).

Distr. Himalaya (Nepal to Bhutan), S. E. Tibet, and W. China (Yunnan).

Rubus calycinoides O. Kuntze, Meth. Sp. Rubus 67, 78 & 83 (1879)–Hara in Journ. Jap. Bot. **47**: 140 (1972).

R. Himalaicus O. Kuntze, l.c. 66, 78, 80 & 83 (1879).

R. Bhotanensis O. Kuntze, l.c. 67, 78 & 82 (1879).

R. Darschilingensis O. Kuntze, l.c. 67, 78 & 82 (1879).

R. diffissus Focke: Fl. E. Himal. 128 (1966); **2**: fig. 5m (1971).

DARJEELING. 2200 m (Jul. 24 & 25, 1972, fl. white); Rimbick–Palmajua, 2100 m (Aug. 6, 1972, fl.).

Distr. Himalaya (Nepal to Bhutan) and ?Khasia.

Rubus Griffithii Hook. f., Fl. Brit. Ind. **2**: 327 (1878), e typo.

R. hexagynus Roxb. sensu Hara, Fl. E. Himal. 129 (1966).

Distr. Himalaya (Nepal, Sikkim).

Rubus nepalensis (Hook. f.) O. Kuntze, Meth. Sp. Rubus 125 (1879)–Hara in Journ. Jap. Bot. **47**: 112, in adnota (1972).

R. nutans var. *nepalensis* Hook. f., Fl. Brit. Ind. **2**: 334 (1878), e typo.

R. nutantiflorus Hara: Fl. E. Himal. 130 (1966).

NEPAL. Thale–Dunche, 2100–2200 m (Jun. 3 & 5, 1969, fl.); Shewaden–Papung, 2100–2600 m (Jun. 29, 1972, fl.); Mangen–Khodang Danda, 3200 m (Aug. 28, 1972, fl.).

Distr. Himalaya (Garhwal to Sikkim).

The species is very variable in the amount of long rufous stiff hairs on stems, petioles, peduncles, and calyces.

Rubus paniculatus Smith: Fl. E. Himal. 131 (1966).

NEPAL. Kakani, 2200 m (Jun. 20, 1967, fr.); Thale–Dunche, 2200–2000 m (Jun. 3, 1969); Shewaden–Papung, 2600–2000 m (Jun. 29, 1972); Basantapur, 2300 m (Jul. 7, 1972, fl.); Khodang Danda–Latsu, 2400 m (Aug. 29, 1972, fr. black-purple).

DARJEELING. 2200–2250 m (Jun. 23 & 24, 1969, fl.); around Ghum (Jul. 6 & 7, 1969, fl.); Palmajua–Batasi, 2200–2100 m (Aug. 8, 1972, fl.).

BHUTAN. Ritang–Rukubi, 2600–2800 m (Apr. 13, 1967).

Distr. Himalaya (Rajaori to Bhutan) and Khasia.

f. **tiliaceus** (Smith) Hara, stat. nov.

Rubus tiliaceus Smith in Rees, Cyclop. **30**: *Rubus* (1819)–Focke in Bibl. Bot. **17** (72): 73 (1910).

R. cordifolius (non Noronha 1790, nec Weihe et Nees 1822) D. Don, Prodr. Fl. Nepal. 233 (1825).

NEPAL. Phulchoki, Kathmandu, 2200–2700 m (Jun. 23, 1967 & May 28, 1972, fr.); Dunche, 1600 m (Jun. 26, 1970, fr.).

DARJEELING. Ratho Chu–Raman, 2100–2400 m (Aug. 4, 1972, fl.); Batasi–Mani Bhanjyang, 2100–2000 m (Aug. 9, 1972, fr.).

Distr. Himalaya (Kumaon to Sikkim).

Rubus pungens Cambes. in Jacquem., Voy. **4**: 48, t. 59 (1835–36).

var. **horridulus** Hara in Journ. Jap. Bot. **47**: 140 (1972).

R. horridulus (non P. J. Mueller 1868) Hook. f., Fl. Brit. Ind. **2**: 341 (1878).

R. parapungens Hara, Fl. E. Himal. **2**: 58 (1971).

Distr. sp. Himalaya (Kashmir to Bhutan), N. Burma, China, Korea, and Japan. The variations in this species was discussed by Hara (l.c. 141, 1972).

Rubus rugosus Smith in Rees, Cyclop. **30**: *Rubus* 34 (1819)–Focke in Bibl. Bot. **17** (72): 92 (1910).

R. rugosus Hamilt. ex D. Don, Prodr. Fl. Nepal. 234 (1825).

R. Hamiltonianus Ser. in DC., Prodr. **2**: 560 (1825).

R. moluccanus L. sensu Hook. f., Fl. Brit. Ind. **2**: 330 (1878), p.p.

NEPAL. Godawari, Kathmandu, 1500 m (Chuma, Sep. 8, 1970, no. 29, fl.).

BHUTAN. Mishichen–Khosa, 1700 m (May 10, 1967).

Distr. E. Himalaya and Khasia.

Rubus Treutleri Hook. f.: Fl. E. Himal. 132 (1966).

R. arcuatus O. Kuntze, Meth. Sp. Rubus 66 & 78 (1879).

R. rosulans O. Kuntze, l.c. 65 & 78 (1879).

R. Tonglooensis O. Kuntze, l.c. 66 & 78 (1879).

NEPAL. Gupha Pokhari, 2800 m (Jul. 4, 1972, no. 721084, fl. pink); Chauke–Dor, 2900–2600 m (Jul. 6, 1972, fl.).

DARJEELING. Tonglu, 2800–3100 m (Jul. 11 & 12, 1969; Jul. 30, 1972, fl. pink).

Distr. Himalaya (Nepal to Bhutan) and W. China.

Rubus Wardii Merrill in Brittonia **4**: 84 (1941)–Hara in Journ. Jap. Bot. **47**: 142 (1972).

R. gigantiflorus Hara: Fl. E. Himal. 129 (1966); **2**: fig. 5 i (1971).

Distr. E. Himalaya (Sikkim), S. E. Tibet, N. Burma, and W. China.

Sibbaldia perpusilloides (W. W. Smith) Hand.-Mzt., Symb. Sin. **7**: 520 (1933)–Chatterjee in Not. Bot. Gard. Edinb. **19**: 326 (1938).

Potentilla perpusilloides W. W. Smith in Rec. Bot. Surv. Ind. **4**: 188 (1911).

NEPAL. Banduke Pokhari (Duo Tulo Pokhari), 4200 m (Jun. 15, 1972, no. 720502, fl.).

Distr. E. Himalaya (E. Nepal and Sikkim) and W. China (Yunnan).

Sibbaldia sikkimensis (Prain) Chatterjee in Not. Bot. Gard. Edinb. **19**: 327 (1938).

Potentilla sikkimensis Prain in Journ. Asiat. Soc. Beng. **73**: 201 (1904).

NEPAL. Kipuphu, 4500 m (Jun. 26, 1972, no. 720787, fl.); Kipuphu–Phujeng La, 4500–4800 m (Jun. 27, 1972, no. 727277, fl.).

Distr. E. Himalaya (E. Nepal and Sikkim).

Sorbus Kurzii (Watt ex Prain) C. K. Schneider in Bull. Herb. Boiss. ser. 2, **4**: 315 (1906).

Pyrus Kurzii Watt ex Prain in Journ. Asiat. Soc. Beng. **73**: 203 (1904).

NEPAL. Minchin Dhap–Mul Pokhari, 2500–2900 m (Oct. 29, 1963, no. 6301806, fr.); Dor–Tute, 2300–2600 m (Jul. 7, 1972, no. 727274).

Distr. Himalaya.

Sorbus microphylla Decne.: Fl. E. Himal. 133 (1966); **2**: 61 (1971).

NEPAL. Topke Gola, 3700 m (Jun. 19, 1972, no. 720602, fl.); Thudam, 3400 m (Jun. 24, 1972, no. 727273, fl.; Jun. 25, 1972, no. 720755, fl.).

Distr. E. Himalaya (E. Nepal to Sikkim) and W. China.

Sorbus Wallichii (Hook. f.) Ohashi, comb. nov.

Pyrus Wallichii Hook. f., Fl. Brit. Ind. **2**: 376 (1878).

S. foliolosa (Wall.) Spach. sensu C. K. Schneider, Ill. Handb. Laubh. **1**: 680 (1906).

BHUTAN. Gasa, 2800 m (May 14, 1967, no. 12894, fl.).

Distr. Himalaya (Nepal to Bhutan).

LEGUMINOSAE (by Hiroyoshi Ohashi)

Abrus precatorius L., Syst. Nat. ed. 12, **2**: 472 (1767)–Baker in Fl. Brit. Ind. **2**: 175 (1876)–Breteler in Blumea **10**: 617, t. 5 (1960)–Verdcourt in Kew Bull. **24**: 240 (1970).

subsp. **precatorius**

NEPAL. Tamur Bridge–Mohamabedi Khola, 300 m (Jul. 9, 1972).

Distr. Tropics and subtropics of Asia, Pacific Is., Australia, and Africa.

Acacia Catechu (L. f.) Willd.: Ohashi in Fl. E. Himal. 135 (1966).

NEPAL. Ghorwa–Sanichare, 200 m (Dec. 10, 1963); Sukaura–Arughat Bazar, 400–560 m (Jan. 9, 1970); Dharan, 200 m (Jun. 1, 1972); Tamur Bridge, on riverbed, 300 m (Jun. 3, 1972).

Distr. Himalaya, India, Burma, Thailand, and W. China (Yunnan). Often planted in other regions.

Acacia Farnesiana (L.) Willd., Sp. Pl. **4**: 1083 (1806)–Baker in Fl. Brit. Ind. **2**: 292 (1878)–Brenan in Fl. Trop. E. Africa, Leg.-Mimosoid. 111 (1959).

Mimosa Farnesiana L., Sp. Pl. ed. 1, 521 (1753)–Roxb., Hort. Beng. 40 (1814); Fl. Ind. ed. 2, **2**: 557 (1832).

Vachellia Farnesiana (L.) Wight et Arn., Prodr. 272 (1834)–Wight, Icon. **1**: t. 300 (1840).

NEPAL. Biratnagar, 200 m (Dec. 19, 1963).

Distr. Tropics but native of tropical America, often cultivated as an ornamental and sometimes naturalized.

Acacia lenticularis Buch.-Ham. [in Wall., Cat. no. 5244 (1831–32), nom. nud.] ex Benth. in Hook., Lond. Journ. Bot. **1**: 508 (1842)–Baker in Fl. Brit. Ind. **2**: 296 (1878).

NEPAL. Dhara Pani–Mohamabedi Khola, 800 m (Jun. 3, 1972, no. 720136, fl.).

Distr. Himalaya.

Acacia pennata (L.) Willd.: Fl. E. Himal. 135 (1966).

Acacia intsia (L.) Willd. var. *oxyphylla* Baker sensu Ohashi, l.c. 135 (1966).

Albizia myriophylla Benth. sensu Ohashi, l.c. 137 (1966).

NEPAL. Dumhan–Taplejung, 700–2000 m (Nov. 1, 1963); Bharomdin–Tharpu, 1000–1200 m (Nov. 25, 1963); Dharan–Dhara Pani, 400–1300 m (Jun. 2, 1972); Dhara Pani–Teku Nala, 300–1000 m (Jun. 3, 1972); Mohamabedi Khola, 400 m (Jun. 3, 1972).

DARJEELING. Tista, 300–500 m (Aug. 10, 1972).

Distr. Tropics of the Old World.

Aeschynomene indica L.: Fl. E. Himal. 135 (1966)–Ohashi in Journ. Fac. Sci. Univ. Tokyo, sect. 3, **11**: 31 (1971).

NEPAL. Barabise–Thale, 850–2050 m (Sep. 9, 1970).

Distr. Tropics to warm temperate regions of the world.

Albizia chinensis (Osb.) Merr.: Fl. E. Himal. 136 (1966); **2**: 61 (1971).

NEPAL. Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

Albizia Julibrissin Durazz.[1]: Fl. E. Himal. 136 (1966).

var. **Julibrissin**

BHUTAN. Tongsa–Tashiling, 2200–2300 m (Apr. 19, 1967); Thargyal Mathur Bridge, 1500 m (Jun. 2, 1967).

var. **mollis** (Wall.) Benth. ex Baker in Fl. Brit. Ind. **2**: 300 (1878).

Acacia mollis Wall., Pl. As. Rar. **2**: 76, t. 177 (1831).

Albizia mollis (Wall.) Boiv.: Fl. E. Himal. **2**: 62 (1971)–Stainton, Forest. Nepal, fig. 36 (1972).

Albizia julibrissin subsp. *mollis* (Wall.) Ali in Pakistan Journ. Forest. **17** (3): 368 (1967).

NEPAL. Nagarjun, 2100 m (Apr. 29, 1970); Chitlang–Thankot, 1700–2200 m (Sep. 4, 1970).

Distr. Tropical to warm temperate Asia and N. Africa. Often cultivated in other regions.

Albizia lucida Benth.: Fl. E. Himal. 136 (1966), ut *A. lucida* (Roxb.) Benth.

Mimosa lucida Roxb. (1832), non Vahl (1807).

A. Meyeri Richer in Journ. Wash. Acad. Sci. **8**: 242 (1918).

NEPAL. Tarpu Ghat–Tarku, 430–500 m (Jan. 12, 1970).

Distr. Himalaya (Nepal to Bhutan), Assam, Burma, Thailand, W. China, and Formosa.

Albizia procera (Roxb.) Benth. in Hook., Lond. Journ. Bot. **3**: 89 (1844)–Baker in Fl. Brit. Ind. **2**: 299 (1878).

Mimosa procera Roxb., Pl. Coromand. **2**: 12, t. 121 (1798); Fl. Ind. ed. 2, **2**: 548 (1932).

Acacia procera Willd., Sp. Pl. **4**: 1063 (1806).

NEPAL. Ghorwa–Sanichare, 200–300 m (Dec. 10, 1963).

Distr. Himalaya, India, and Burma.

Alysicarpus vaginalis (L.) DC.: Fl. E. Himal. 137 (1966).

NEPAL. Nijgar–Patlaia, 100 m (Nov. 15, 1970).

Amphicarpaea ferruginea Benth. in Miq., Pl. Jungh. 232 (1852).

Shuteria? ferruginea (Benth.) Baker in Fl. Brit. Ind. **2**: 182 (1876)–Hand.-Mzt., Symb. Sin. **7**: 578 (1933).

NEPAL. Phulchoki, 2700 m (Jul. 15, 1972, fl., no. 727155); Daman, 2500 m (Aug. 15, 1972, no. 727209); Dunche-Singum Gompa, 1900–3200 m (Aug. 22, 1972, fl., nos. 721815 & 727159); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972, fl., nos. 722043 & 727160).

Distr. Himalaya (Nepal) and W. China (Yunnan and Szechuan).

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[1] *Albizia Julibrissin* Durazz.

var. **glabrior** (Koidz.) Ohashi, comb. nov.

A. mollis (Wall.) Boiv. var. *glabrior* Koidz. [in Mayebara, Fl. Austro-higo. 18 (1931), nom. nud.] in Act. Phytotax. Geobot. **1**: 18 (1932).

A. glabrior (Koidz.) Ohwi in Journ. Jap. Bot. **12**: 657 (1936); Fl. Jap. 672 (1953); ed. Engl. 553 (1965) & ed. rev. 783 (1965).

Apios carnea (Wall.) Benth. ex Baker: Fl. E. Himal. 140 (1966).

DARJEELING. Phalut–Ratho Chu, 2100–3600 m (Aug. 4, 1972, fl.).

Distr. Himalaya (Nepal and Sikkim), Assam, Burma, Thailand, Indo-China, and China.

Arachis hypogaea L., Sp. Pl. ed. 1, 741 (1753)–Baker in Fl. Brit. Ind. **2**: 161 (1876).

NEPAL. Sim Chotala–Bainse, 800–970 m (Jun. 7, 1969, fl.).

Distr. Native of Brazil, cultivated widely as a crop.

Astragalus bhotanensis Baker in Hook. f., Fl. Brit. Ind. **2**: 126 (1876)–Lauener in Not. Bot. Gard. Edinb. **30**: 240 (1970).

BHUTAN. Thimphu, 2450 m (Apr. 29, 1967); Tzatogang–Dotanang, 2700 m (May 27, 1967, fl.); Tabab–Thimphu, 2500 m (May 28, 1967, fl.); Thimphu–Chimakhothi (Jun. 1, 1967, fl.).

Distr. E. Himalaya (Bhutan) and China.

Astragalus concretus Benth. in Royle, Ill. Bot. Himal. **1**: 199 (1835).

A. vicioides Grah. [in Wall., Cat. no. 5931 (1831–32), nom. nud.] ex Baker in Fl. Brit. Ind. **2**: 131 (1876), non Ledeb. (1831).

NEPAL. Tsedang Pokhari–Panghu Danda, 3100 m (Aug. 23, 1969); Yatumbal–Oo Kharka, 3100 m (Jun. 30, 1970, fl.); Kyangjing–Langtang, 3000–3800 m (Jul. 16, 1970); Trisuli Khola–Singum Gompa, 2700 m (Aug. 22, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972).

Distr. Himalaya (Kashmir to Nepal).

The flowering specimens of this species are occasionally identified as *Hedysarum strobiliferum*.

Astragalus emodi Steud., Nomen. ed. 2, **1**: 161 (1840)–Baker in Fl. Brit. Ind. **2**: 130 (1876).

NEPAL. Lukthang–Kalingchok, 3300–3650 m (Sep. 28, 1970); Gopte–Thale Patil, 3200–3500 m (Aug. 26, 1972).

Distr. Himalaya (Kumaon and Nepal).

Astragalus lessertioides Benth. ex Bunge, Astragali **1**: 24 (1868) & **2**: 28 (1869)–Baker in Fl. Brit. Ind. **2**: 124 (1876).

NEPAL. Lama Chungbu–Samdan, 4300 m (Jun. 24, 1972, no. 720710).

Distr. E. Himalaya (E. Nepal and Sikkim).

Astragalus leucocephalus Grah. [in Wall., Cat. no. 5923 (1831–32), nom. nud.] ex Benth. in Royle, Ill. Bot. Himal. 198, t. 32, fig. 2 (1835)–Baker in Fl. Brit. Ind. **2**: 128 (1876)–Collett, Fl. Siml. 125 (1921).

NEPAL. Shyaprubensi–Tangjet, 1500–2240 m (Jun. 27, 1970).

Distr. Afghanistan and Himalaya (Kumaon to Nepal).

Astragalus pyonorhizus Wall. [Cat. no. 5927 (1831–32), nom. nud.] ex Benth. in Royle, Ill. Bot. Himal. 199 (1835)–Baker in Fl. Brit. Ind. **2**: 119 (1876)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 162 (1955).

A. Donianus DC. sensu Ohashi in Fl. E. Himal. **2**: 62 (1971).

NEPAL. Roll–Jarjare, 2910–3100 m (May 3, 1970, Kanai no. 671704); Langtang–Kyangjing, 3500 m (Jul. 13, 1970, Kanai & Shakya no. 672481); Thudam, 3600 m (Jun. 24, 1972, fl.); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Distr. E. Himalaya (Nepal to Sikkim).

Sometimes *Astragalus Donianus* is difficult to distinguish from *A. pycnorhizus*. Among our collections the specimens of Kanai & Shakya 672481 and Kanai 671704 are apparently intermediate between both species. For example, Kanai 671704 has the calyces of *A. Donianus*-type, i.e. calyx-teeth half as long as the tube, but has the wing-petals of *A. pycnorhizus*-type, i.e. wings shorter than the keel-petals.

Astragalus sikkimensis Benth. ex Bunge, Astragali **1**: 23 (1868) & **2**: 28 (1869)-Baker in Fl. Brit. Ind. **2**: 126 (1876).

NEPAL. Thale Bisauna-Tingoang, 2750-3100 m (Sep. 11, 1970); Tingoang-Khosori Khabre, 3000 m (Sep. 12, 1970).

Distr. E. Himalaya (Nepal to Sikkim).

Astragalus stipulatus D. Don ex Sims: Fl. E. Himal. 140 (1966).

var. **phulchokiensis** Ohashi, var. nov.

A typo differt: Calyx glaber sed vulgo lacinia sparsim ciliatus; laciniis tubo brevioribus. Corolla et lutea et purpurea; vexillo ceteris petalorum longiore.

NEPAL. Phulchoki, 2200 m (Sep. 6, 1972, Kanai no. 722126, fl. & young fr. Holotype in TI, isotypes in TI, KYO, BM).

Distr. sp. E. Himalaya (C. Nepal to Bhutan).

Astragalus xiphocarpus Benth. ex Bunge: Fl. E. Himal. 140 (1966); **2**: 62 (1971).

NEPAL. Gorza Gaon-Bhuje, 2700 m (Jul. 3, 1972); Tinjure, 2900 m (Jul. 6, 1972, fl.).

Atylosia mollis Benth.: Fl. E. Himal. 140 (1966).

BHUTAN. Choojom-Mishina, 1500-1500 m (Apr. 27, 1967); Tinlegang-Gon Chungnang, 1950-1800 m (May 5, 1967).

Distr. Himalaya (Garhwal and Kumaon to Bhutan), Assam, and China (Yunnan).

Atylosia scarabaeoides (L.) Benth.: Fl. E. Himal. 140 (1966).

NEPAL. Sangu-Luitel, 390 m (Jan. 11, 1970).

BHUTAN. Choojom-Wangdu Phodrang, 1500-1450 m (Apr. 27, 1967).

Atylosia volubilis (Blanco) Gamble, Fl. Madras 369 (1918).

Cytisus volubilis Blanco, Fl. Filip. 599 (1837).

A. mollis Benth. sensu Baker in Fl. Brit. Ind. **2**: 213 (1876), p.p.

A. crassa Prain in Journ. Asiat. Soc. Beng. **66** (2): 45 & 432 (1897).

Cantharospermum volubile (Blanco) Merrill in Philip. Journ. Sci. **5**: 127 (1910).

NEPAL. Patlaia-Sakti Mohar Khola, 200 m (Apr. 18, 1969).

Distr. Tropical Himalaya, India, Burma, S. E. Asia, and Malaysia.

Bauhinia Vahlii Wight et Arn.: Fl. E. Himal. 141 (1966).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972, fr.).

Bauhinia variegata L., Sp. Pl. ed. 1, 375 (1753)-Baker in Fl. Brit. Ind. **2**: 284 (1878)-de Wit in Reinwardtia **3**: 411 (1956).

B. candida Ait., Hort. Kew. **2**: 49 (1789)-Roxb., Fl. Ind. ed. 2, **2**: 319 (1832).

NEPAL. Gairi, 520 m (Jan. 8, 1970); Teku Nala-Dhankuta, 800-1300 m (Jun. 4, 1972, fl.).

Distr. Himalaya, India, Burma, and China. According to de Wit (1956), its native distribution is possibly in China.

Butea minor Buch.-Ham. ex Baker: Fl. E. Himal. 141 (1966)-Stainton, Forest. Nepal, fig. 32 (1972).

NEPAL. Dunche–Shyaprubensi, 1500–2000 m (Jun. 26, 1970); Khosori Khabre–Barabise, 1000 m (Sep. 13, 1970); Dingla–Doban, 700 m (Jul. 2, 1972, fl.); Teku Nala, 800 m (Jul. 8, 1972, fl.); Sanguri Bhanjyang–Dharan, 700 m (Jul. 10, 1972, fl.).

Butea monosperma (Lam.) Taub. in Pfl.-fam. III, **3**: 366 (1894).

Erythrina monosperma Lam., Encycl. Méth. **1**: 391 (1785).

B. frondosa Roxb., Pl. Coromand. **1**: 21, t. 21 (1795); Fl. Ind. ed. 2, **3**: 244 (1832)–Baker in Fl. Brit. Ind. **2**: 194 (1876).

NEPAL. Sim Bhanjyang, 1200 m (Mar. 1, 1970).

Distr. Himalaya, India, Ceylon, S. E. Asia, and Malaysia.

Caesalpinia decapetala (Roth) Alst.[1] in Trimen, Handb. Fl. Ceyl. 6, Suppl. 89 (1931)–Fl. Phulchoki & Godawari 24 (1969)–Stainton, Forest. Nepal, fig. 39 (1972).

Reichardia decapetala Roth, Nov. Sp. 212 (1821).

C. sepiaria Roxb.: Fl. E. Himal. **2**: 62 (1971).

NEPAL. Phulchoki, 1800 m (Jul. 15, & Sep. 6, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Dunche–Trisuli Khola, 1900–2000 m (Aug. 22, 1972).

Campylotropis speciosa (Royle ex Schindler) Schindler in Fedde, Rep. **11**: 425 (1912)–Ohashi in Journ. Jap. Bot. **49**: 330 (1974).

Lespedeza eriocarpa DC. sensu Maxim. in Act. Hort. Petrop. **2**: 350 (1873)–Baker in Fl. Brit. Ind. **2**: 144 (1876).

L. speciosa Royle [in Maxim. in Act. Hort. Petrop. **2**: 350 (1873), pro syn.] ex Schindler in Fedde, Rep. **9**: 519 (1911).

L. indica Schindler, l.c. **9**: 515 (1911).

C. eriocarpa Schindler, l.c. **11**: 347 (1912).

C. macrostyla (D. Don) Schindler var. *eriocarpa* (Royle ex Maxim.) Ohashi in Fl. E. Himal. 142 (1966).

NEPAL. Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972, fl.).

BHUTAN. Yuwak–Wangdu Phodrang, 1600–1400 m (Apr. 9, 1967, fl. & young fr.); Kyebaka–Samtengang, 1600–2100 m (Apr. 10 & 26, 1967, fl.); Tinlegang–Gon Chungnang, 1800–1950 m (May 5, 1967, fl.)

Distr. Himalaya (Kashmir to Bhutan) and Assam (Khasia).

Caragana nepalensis Kitamura in Act. Phytotax. Geobot. **15**: 132 (1954); in Kihara, Fauna Fl. Nepal Himal. 163, f. 34 (1955).

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1) **Caesalpinia decapetala** (Roth) Alst.
var. **japonica** (Sieb. et Zucc.) Ohashi, comb. nov.

Caesalpinia Crista Thunb., Fl. Jap. 179 (1784), non L. (1753).

C. japonica Sieb. et Zucc. in Abh. Akad. Muench. **4** (2): 117 (1845)–Franch. et Sav., Enum. Pl. Jap. **1**: 114 (1875)–Makino et Nemoto, Fl. Jap. ed. 1, 706 (1925); ed. 2, 553 (1931)–Rehd., Man. Cult. Tr. Shrub. ed. 2, 448 (1940)–Ohwi, Fl. Jap. 673 (1953); ed. Engl. 554 (1965); ed. rev. 784 (1965).

C. sepiaria Roxb. sensu Miq., Prol. Fl. Jap. 242 (1867)–Matsum. in Bot. Mag. Tokyo **16**: 99 (1902); Index Pl. Jap. **2**: 251 (1912)–Masamune in Sci. Rep. Kanazawa Univ. **3**: 122 (1955).

C. sepiaria Roxb. var. *japonica* (Sieb. et Zucc.) Hand.-Mzt. [Symb. Sin. **7**: 543 (1933), comb. nud., in nota] ex Honda, Pl. Siebold. in Siebold-Kenkyu 553 (1938)–Makino, Ill. Fl. Nippon 431 (1940), ut var. *japonica* Makino–Koyama, Ohashi & Fukuoka in Mem. Nat. Sci. Mus. **3**: 346 (1970)–Kitamura et Murata, Colour. Ill. Woody Pl. Jap. **1**: 358, pl. 71, fig. 442 (1971).

C. decapetala (Roth) Merr. sensu Hatusima, Fl. Ryukyus 344 (1971).

NEPAL. Langtang Gorge–Langtang, 3100 m (Jul. 12, 1970, fl.).

Distr. Himalaya (Nepal).

Cassia floribunda Cavanilles, Descr. 132 (1802)–de Wit in Webbia **11**: 245 (1955)–Fl. Phulchoki & Godawari 25 (1969).

C. laevigata Willd., Enum. Hort. Berol. 441 (1809)–Prain in Journ. Asiat. Soc. Beng. **66** (2): 476 (1897).

Senna aurata Roxb., Fl. Ind. ed. 2, **2**: 342 (1832).

C. aurata Roxb. [Hort. Beng. 32 (1814), nom. nud.] ex Vogel, Syn. Cass. 17 (1837).

C. occidentalis L. sensu Ohashi in Fl. E. Himal. 144 (1966), p.p.

NEPAL. Balaju, 1300 m (Jun. 16, 1967); Gokarna, Kathmandu, 1400 m (Jun. 22, 1967).

SIKKIM. Singhik, 1500 m (Jun. 30, 1969).

Cassia mimosoides L.

subsp. **mimosoides**: Fl. E. Himal. 144 (1966), in nota.

var. **mimosoides**

NEPAL. Dunche–Shyaprubensi, 1500–2000 m (Jun. 26, 1970); Khosori Khabre–Barabise, 800–1500 m (Sep. 13, 1970).

var. **Wallichiana** Baker in Fl. Brit. Ind. **2**: 266 (1878)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 164 (1955).

NEPAL. Shyaprubensi–Tangjet, 1500–2240 m (Jun. 27, 1970).

Distr. sp. Tropical to warm temperate regions in Asia, and tropical Africa, Australia and America.

Cassia Sophera L.: Fl. E. Himal. 145 (1966); **2**: 63 (1971).

C. occidentalis L. sensu Ohashi, l.c. 144 (1966), p.p.

NEPAL. Khosori Khabre–Barabise, 1000 m (Sep. 13, 1970).

Cassia Tora L., Sp. Pl. ed. 1, 376 (1753)–Baker in Fl. Brit. Ind. **2**: 263 (1878), p.p. min.–Prain in Journ. Asiat. Soc. Beng. **66** (2): 158 & 475 (1897)–de Wit, l.c. 276 (1955).

Senna Tora Roxb., Fl. Ind. ed. 2, **2**: 340 (1832).

NEPAL. Trisuli–Bainse, 800 m (Jun. 1, 1969, fl.); Khosori Khabre–Barabise, 1000 m (Sep. 13, 1970); Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972).

SIKKIM. Papung, 500 m (Jun. 28, 1969, fl.).

Distr. Tropics, probably of S. American origin.

Chesneya nubigena (D. Don) Ali in Scientist (Karachi) **3**: 4 (1959).

Astragalus nubigenus D. Don, Prodr. Fl. Nepal. 245 (1825).

Caragana crassicaulis Benth. ex Baker in Fl. Brit. Ind. **2**: 117 (1876).

Calophaca crassicaulis (Benth. ex Baker) Komarov in Act. Hort. Petrop. **29**: 357 (1909).

Astragalus larkyaensis Kitamura in Kihara, Peoples Nepal Himal. 421 (1957)–Ohashi in Phot.-Alb. Pl. E. Himal. f. 214 (1968); in Fl. E. Himal. **2**: 62 (1971).

NEPAL. Topke Gola–Jalang Chhyongo, 4000–4300 m (Jun. 20, 1972 fl.); Janga La–Thudam, 4300 m & 4400 m (Jun. 21, 1972 fl.); Kipuphu, 4500 m (Jun. 27, 1972, fl.); Singum Gompa–Gosainkund (Aug. 23, 1972, fl.); Gosainkund, 4000–4400 m (Aug. 24, 1972, fl.).

BHUTAN. Laum Thang–Singke La, 4100–5000 m (May 19, 1967, fl.); Yale La, 4800 m (May 23, 1967, fl.).

Distr. Himalaya (Kumaon to Bhutan), W. Tibet, Burma, and China.

Chesneya polystichoides (Hand.-Mzt.) Ali in Scientist (Karachi) **3**: 10 (1959).

subsp. **bhutanica** Ohashi, subsp. nov. [Fig. 10]

Astragalus nubigenus D. Don sensu Ohashi in Phot.-Alb. Pl. E. Himal. f. 215 (1968); in Fl. E. Himal. **2**: 62 (1971).

A typo (=subsp. *polystichoides*) folio 11–14 jugo pinnato, foliolo numero 23–29, apice mucronulate acuto, calyce albo-sericeo differt.

Nepal. Chandanbari, 1200 ft. (Saman & Bista no. 13129, KATM, TI).

Bhutan. Singke La–Chawa Gassar, 4600 m, on alpine grassland (Kanai, Murata, Ohashi & Yamazaki no. 11623, May 19, 1967, fl. Holotype in TI, isotypes in TI, KYO, BM, E); loc. cit. 4700 m (K.M.O.Y. no. 11430, fl.); loc. cit. 4200 m (K.M.O.Y. no. 11431, fl.); Laum Thang–Singke La, 4800 m (K.M.O.Y. no. 11444, May 19, 1967); Cheka–Tremo La, 4000 m (K. Nishioka, Jun. 23, 1966, fl.).

Distr. subsp. Himalaya (Nepal and Bhutan).

Christia vespertilionis (L. f.) Bakh. f. ex van Meeuwen in Reinwardtia **6**: 90 (1961).

Hedysarum vespertilionis L. f., Suppl. 331 (1781).

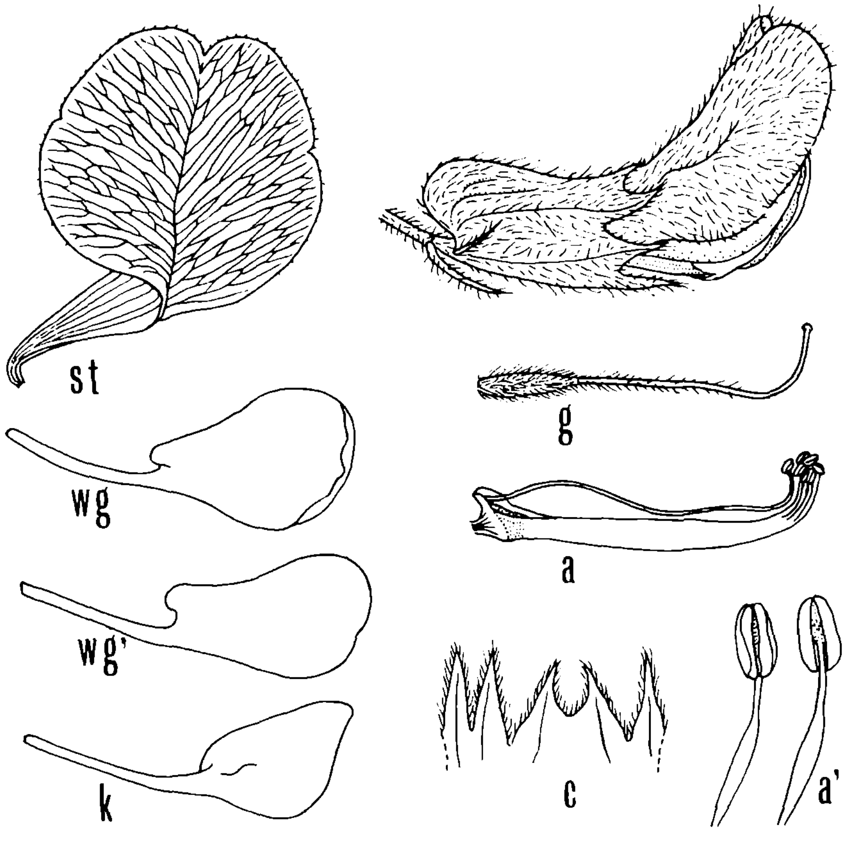

Fig. 10. Flower of *Chesneya polystichoides* subsp. *bhutanica*. st. Standard, wg. Left wing, wg'. Right wing, k. Keel-petal, a. Androecium, a'. Anther and upper part of filaments, g. Gynoecium, c. Calyx from the inside. All ×2 except for a' ×8. From the isotype.

Lourea vespertilionis (L. f.) Desv. in Journ. de Bot. **1**: 122, t. 5, f. 18 (1813)–Baker in Fl. Brit. Ind. **2**: 154 (1876).

BHUTAN. Choojom, 1500 m (Apr. 27, 1967).

Distr. Probably a native of tropical Asia.

Cochlianthus gracilis Benth. in Miq., Pl. Jungh. 234 (1852)–Baker in Fl. Brit. Ind. **2**: 193 (1876)–Fl. Phulchoki & Godawari 25 (1969).

NEPAL. Phulchoki, 2700 m (Jun. 26, 1967; Jul. 15, 1972; Sep. 6, 1972, fl.); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972, fl.); Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972, fl.); Bhorlang–Sundarijar, 2400–1400 m (Aug. 31, 1972, fl.).

Distr. Himalaya and W. China (Yunnan and Szechuan).

Codariocalyx motorius (Houtt.) Ohashi: Ohashi in Fl. E. Himal. 145 (1966); **2**: 63 (1971); in Ginkgoana **1**: 46, pl. 1 b (1973).

NEPAL. Kagne, 700 m (Jan. 7, 1970); Chitlang–Chandragiri, 1750–2250 m (Sep. 4, 1970); Phulchoki (Sep. 6, 1972).

Crotalaria alata Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 241 (1825)–Baker in Fl. Brit. Ind. **2**: 69 (1876)–Polhill in Fl. Trop. E. Afr., Leg.-Papil. 949 (1971).

C. bialata Schrank sensu Backer et Bakh. f., Fl. Java **1**: 579 (1963): Fl. E. Himal. 146 (1966); **2**: 63 (1971).

NEPAL. Bainse–Mane Gaon, 1000 m (Jun. 23, 1970); Sim Chotala, 600–900 m (Aug. 19, 1972).

Crotalaria albida Heyne ex Roth: Fl. E. Himal. 145 (1966); **2**: 63 (1971).

NEPAL. Nagarjun, 1500 m (Oct. 2, 1969); Deorali–Chitlang, 1600 m (Sep. 3, 1970); Barabise–Thale, 1700 m (Sep. 9, 1970); Khosori Khabre, 1500 m (Sep. 12, 1970); Bir Gaon, 1600 m (Jun. 30, 1972).

Crotalaria cytisoides Roxb. ex DC., Prodr. **2**: 131 (1825)–Roxb., Fl. Ind. ed. 2, **3**: 276 (1832)–Polhill in Kew Bull. **22**: 247 (1968), in text.

C. psoralioides D. Don (1825), non Lam. (1786), ut *psoraloides*: Fl. E. Himal. **2**: 63 (1971).

NEPAL. Nagarjun, 1500 m (Mar. 1, 1969); Chitlang–Thankot, 2000 m (Sep. 4, 1970).

Crotalaria pallida Ait., Hort. Kew **3**: 20 (1789)–Polhill in Kew Bull. **22**: 262 (1968).

var. **pallida**

C. mucronata Desv.: Fl. E. Himal. 147 (1966); **2**: 63 (1971).

NEPAL. Mohamabedi Khola, 400 m (Jun. 3, 1972, fl.); Dingla–Doban, 800 m (Jul. 2, 1972); Dharan, 400 m (Jul. 10, 1972, fl.).

Crotalaria prostrata Rottb. ex Willd., Enum. Hort. Berol. **2**: 747 (1809)–Roxb. [Hort. Beng. 54 (1814), nom. nud.] Fl. Ind. ed. 2, **3**: 270 (1832)–Baker in Fl. Brit. Ind. **2**: 67 (1876)–de Munk in Reinwardtia **6**: 211 (1962).

C. hirsuta Willd. sensu Ohashi in Fl. E. Himal. 146 (1966).

Distr. Himalaya, India, Ceylon, and Malaysia.

Crotalaria spectabilis Roth, Nov. Sp. 341 (1821)–Polhill in Fl. Trop. E. Afr., Leg.-Papil. 959 (1971).

C. sericea Retz., Observ. Bot. **5**: 26 (1789), non Burm. f. (1768)–Baker in Fl. Brit. Ind. **2**: 75 (1876)–de Munk, l.c. 214 (1962).

C. Eschenaultii DC., Prodr. **2**: 125 (1825)–Baker, l.c. 76 (1876).

C. retusa L. sensu Ohashi in Fl. E. Himal. 147 (1966).

Distr. Tropics.

Dalbergia sericea G. Don: Fl. E. Himal. 148 (1966); **2**: 64 (1971).

NEPAL. Dunche–Shyaprubensi, 1500–2000 m (Jun. 26, 1970).

Dalbergia Sisso Roxb.: Fl. E. Himal. 148 (1966).

NEPAL. Mohamabedi Khola–Tamur Bridge, 300 m (Jun. 3 & Jul. 9, 1972, young fr.).

Dalbergia stipulacea Roxb.: Fl. E. Himal. 148 (1966); **2**: 64 (1971).

NEPAL. Dharan–Sanguri Bhanjyang, 500 m & 1300 m (Jun. 2, 1972, young fr.); Dhara Pani–Tamur Bridge, 350 m & 600 m (Jun. 3 & Jul. 10, 1972, young fr.).

DARJEELING. Tista, 400 m (Aug. 10, 1972, young fr.).

Derris marginata (Roxb.) Benth.: Fl. E. Himal. 149 (1966).

D. thyrsiflora (Benth.) Benth. sensu Ohashi, l.c. 149 (1966), p.p.

NEPAL. Iladanda–Helok, 1500–1800 m (Nov. 13, 1963).

DARJEELING. Tista, 400 m (Aug. 10, 1972, fl.).

Derris microptera Benth. in Journ. Linn. Soc. **4**: suppl. 113 (1860)–Baker in Fl. Brit. Ind. **2**: 243 (1876).

SIKKIM. Papung–Temi, 500–1620 m (Jun. 28, 1969).

Distr. E. Himalaya (Sikkim).

Desmodium concinnum DC.: Fl. E. Himal. **2**: 64 (1971).

var. **concinnum**: Ohashi in Ginkgoana **1**: 182, pl. 21b (1973).

NEPAL. Khosori Khabre, 1450 m (Sep. 12, 1970, fl.).

Desmodium confertum DC.: Fl. E. Himal. **2**: 64 & 266, f. 27b (1971); in Ginkgoana **1**: 110 (1973).

NEPAL. Kagne–Samari Bhanjyang, 800 m (Jan. 7, 1970); Bagdeo–Saraswati, 400–420 m (Nov. 14, 1970).

Desmodium elegans DC.: Ohashi in Fl. E. Himal. **2**: 64 & 278, f. 35–37 (1971); in Ginkgoana **1**: 110 (1973).

subsp. **elegans**

var. **argenteum** (Wall. ex Benth.) Ohashi, comb. nov.

D. argenteum Wall. [Cat. no. 5713 (1831–32), nom. nud.] ex Benth. in Miq., Pl. Jungh. 226 (1852), in adnota.

D. tiliaefolium (D. Don) Wall. ex G. Don var. *argenteum* (Wall. ex Benth.) Schindler in Fedde, Rep. **22**: 265 (1926).

NEPAL. Tangjet–Khirojet, 1750–2300 m (Jun. 28, 1970, fl.).

This variety is different from the other infraspecific taxa of *Desmodium elegans* in having both copiously branched panicles and densely silver-grey or yellowish velutinous hairs on the inflorescences, petioles, and under surface of leaflets.

var. **elegans**

NEPAL. Tangjet–Khirojet, 1750–2300 m (Jun. 28, 1970, fl.); Khirojet–Yatumbal, 2250–2700 m (Jun. 29, 1970, fl.); Singum Gompa, 3200 m (Aug. 22, 1972).

DARJEELING. Ratho Chu–Raman, 2100–2400 m (Aug. 4, 1972).

Var. *elegans* found between Ratho Chu and Raman is very similar to *Desmodium podocarpum* subsp. *oxyphyllum*, especially in the shape of leaflets.

Desmodium gangeticum (L.) DC.: Ohashi in Fl. E. Himal. 149 (1966); in Ginkgoana **1**: 184, pl. 22b (1973).

NEPAL. Nijgar, 200 m (Apr. 19, 1969).

Desmodium heterocarpon (L.) DC.: Fl. E. Himal. 149 (1966); **2**: 65 (1971).

subsp. **heterocarpon**

var. **heterocarpon**: Ohashi in Ginkgoana **1**: 213, pl. 29a (1973).

NEPAL. Nagarjun (Oct. 2, 1969); Barabise-Thale, 850–2050 m (Sep. 9, 1970); Latsu-Bhorlang, 1700–2400 m (Aug. 30, 1972).

var. **strigosum** van Meeuwen in Reinwardtia **6**: 95 (1961) & 251 (1962)–Ohashi in Ginkgoana **1**: 215, pl. 29b (1973).

NEPAL. Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Desmodium laxiflorum DC.: Fl. E. Himal. 151 (1966).

subsp. **laxiflorum**: Ohashi in Ginkgoana **1**: 101, pl. 12 (1973).

NEPAL. Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

DARJEELING. Tista, 400 m (Aug. 10, 1972, fl.).

Desmodium multiflorum DC.: Ohashi in Fl. E. Himal. **2**: 65 & 272 (1971); in Ginkgoana **1**: 110 (1973).

NEPAL. Thale, 2000 m (Sep. 9, 1970); Thale–Thale Bisauna, 2200 m (Sep. 10, 1970); Khosori Khabre, 1500 m (Sep. 12, 1970); Shewaden–Papung, 2000–2600 m (Jun. 29, 1972); near Nessum, 1300 m (Jul. 2, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20,1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972); Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

Desmodium podocarpum DC.: Ohashi in Fl. E. Himal. 153 (1966); in Ginkgoana **1**: 142, pls. 19–20 (1973).

subsp. **oxyphyllum** (DC.) Ohashi in Fl. E. Himal. **2**: 65 (1971).

var. **oxyphyllum**

NEPAL. Nagarjun, 1500 m (Oct. 2, 1969, fr.); Okhre Danra–Deorali, 1450–1950 m (Sep. 2, 1970, fl.); Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972, fl.); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Desmodium sequax Wall.: Fl. E. Himal. **2**: 65 & 315, f. 46b (1971).

NEPAL. Dingla-Doban, 800-1000 m (Jul. 2, 1972, fl. & young fr.).

Desmodium triflorum (L.) DC.: Ohashi in Fl. E. Himal. 154 (1966); **2**: 65 (1971); in Ginkgoana **1**: 245, pl. 36b (1973).

NEPAL. Barabise–Thale, 850–2050 m (Sep. 9, 1970); Mohamabedi Khola–Teku Nala, 300–800 m (Jun. 3, 1972, fl.); Dingla, 1000 m (Jul. 1, 1972); Dingla–Doban, 800–1000 m (Jul. 2, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

DARJEELING. Tista, 400 m (Aug. 10, 1972).

Dumasia villosa DC.: Fl. E. Himal. 156 (1966).

BHUTAN. Tinlegang, 1950 m (May 4, 1967); Rinchu, 1500 m (May 8, 1967); Rinchu–Mishichen, 1500–1600 m (May 9, 1967).

Eriosema himalaicum Ohashi: Fl. E. Himal. 156 (1966)–Icon. Cormophyt. Sin. **2**: 509, f. 2747 (1972).

NEPAL. Dakchin Kali–Okhre Danra, 1500–1950 m (Sep. 1, 1970); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Erythrina arborescens Roxb. [Hort. Beng. 53 (1814), nom. nud.] Pl. Coromandel **3**: 14, t. 219 (1811); Fl. Ind. ed. 2, **3**: 256 (1832)–Baker in Fl. Brit. Ind. **2**: 190 (1876)–Hand.-Mzt., Symb. Sin. **7**: 579 (1933)–Krukoff in Journ. Arn. Arb.

53: 130 (1972)–Stainton, Forest. Nepal, fig. 42 (1972).

NEPAL. Khanging–Langtang Gorge, 2600 m (Jul. 11, 1970, fl.); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972, fl.).

DARJEELING. 2200 m (Jul. 25, 1972, fl.).

Distr. Himalaya (Kumaon to Bhutan), Assam (Khasia), and W. China (Yunnan and Szechuan).

Erythrina stricta Roxb. [Hort. Beng. 53 (1814), nom. nud.] Fl. Ind. ed. 2, **3**: 251 (1832)–Baker in Fl. Brit. Ind. **2**: 189 (1876)–Hand.-Mzt., l.c. 579 (1933)–Krukoff, l.c. 132 (1972).

E. variegata L. sensu Ohashi in Fl. E. Himal. 157 (1966), p.p., excl. specim. cit. Sikkim.

Distr. Himalaya (Nepal to Bhutan), Burma, Indo-China, and W. China (Yunnan).

Flemingia macrophylla (Willd.) Merrill in Philip. Journ. Sci. **5**: 130 (1910); Enum. Philip. Fl. Pl. **2**: 317 (1923), ut *F. macrophylla* (Willd.) O. Kuntze ex Prain.

Crotalaria macrophylla Willd., Sp. Pl. **3**: 982 (1800).

F. congesta Roxb. [Hort. Beng. 56 (1814), nom. nud.] ex Aiton, Hort. Kew. ed. 2, **4**: 349 (1812)–Roxb., Fl. Ind. ed. 2, **3**: 340 (1832)–Baker in Fl. Brit. Ind. **2**: 228 (1876).

Moghania macrophylla (Willd.) O. Kuntze: Fl. E. Himal. 159 (1966); **2**: 66 (1971).

NEPAL. Dunche–Shyaprubensi, 1500–2000 m (Jun. 26, 1970).

Flemingia strobilifera (L.) R. Brown ex Aiton, Hort. Kew. ed. 2, **4**: 350 (1812)–Baker in Fl. Brit. Ind. **2**: 227 (1876).

Moghania strobilifera (L.) O. Kuntze, Rev. Gen. Pl. **1**: 199 (1891): Fl. E. Himal. 159 (1966); **2**: 67 (1971).

NEPAL. Nagarjun, Kathmandu (Apr. 28, 1970); Bagdeo–Saraswati, north of Nijgar, 400–420 m (Nov. 14, 1970).

Glycine max (L.) Merrill: Fl. E. Himal. 157 (1966).

NEPAL. Pati Bhanjyang, 1700 m, cult. (Aug. 30, 1972).

Gueldenstaedtia himalaica Baker: Fl. E. Himal. **2**: 66 (1971). [Plate 4a]

G. Santapaui Thothathri: Fl. E. Himal. **2**: 66 (1971).

NEPAL. Langtang–Kyangjing, 3400–3800 m (Jul. 13, 1970); Topke Gola, 3600 m (Jun. 18, 1972, fl.); Thudam, 3400 m (Jun. 22, 1972, fl.); Thudam–Lama Chungbu, 3400–4200 m (Jun. 23, 1972, fl.); Lama Chungbu–Thudam, 3400–4200 m (Jun. 24, 1972, fl.).

Hedysarum campylocarpon Ohashi in Journ. Jap. Bot. **49**: 164 (1974).

NEPAL. Langtang–Kyangjing, 3400–3800 m (Jul. 13, 1970, fl. & young fr.).

Distr. Himalaya (C. Nepal).

A taxonomic treatment of this species is provided on page 374.

Hedysarum sikkimense Benth. ex Baker in Fl. Brit. Ind. **2**: 145 (1876). [Plate 4b]

NEPAL. Thudam–Lama Chungbu, 3400–4200 m (Jun. 23, 1972, fl.); Lama Chungbu, 4200 m (Jun. 24, 1972, fl.).

Distr. Himalaya, Tibet, and W. China.

This species is treated in detail on page 388.

Indigofera bracteata Grah. ex Baker in Fl. Brit. Ind. **2**: 100 (1876)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 166 (1955).

NEPAL. Phulchoki, 2400–2700 m (Jun. 23, 1967, fl.; May 29, 1969, fl.; May 28, 1972; Jul. 15, 1972, fl.); Trisuli Khola–Gosainkund, 2065–3000 m (Jun. 4, 1969); Khirojet–Yatumbal, 2300–2700 m (Jun. 29, 1970); Thale–Thale Bisauna, 2500 m (Sept. 10, 1970); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

Distr. Himalaya (Nepal) and Assam.

Indigofera cylindracea Wall. ex Baker in Fl. Brit. Ind. **2**: 99 (1876)–Ali in Bot. Not. **111**: 568 (1958).

I. pulchella Roxb. sensu Ohashi in Fl. E. Himal. 157 (1966).

NEPAL. Kakani, 2200 m (Jun. 20, 1967, fl.); Phulchoki, 2300–2700 m (Jun. 23, 1967; May 29, 1969; Jun. 10, 1969; Jul. 15, 1972); Nagarkot, 2000 m (Jun. 24, 1967, fl.); Tikabhairab, 1500 m (Feb. 10, 1970); Mane Gaon–Thale, 1200–1900 m (Jun. 24, 1970); Khirojet–Yatumbal, 2300–2700 m (Jun. 29, 1970); Khanging–Langtang Gorge, 2400–2800 m (Jul. 11, 1970); Dor–Chauke, 2600–2900 m (Jun. 7, 1972, fl.); Shewaden–Papung, 2000–2600 m (Jun. 29, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972, fl.); Chitre–Teku Nala, 800–2400 m (Jul. 8, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

DARJEELING. Phalut–Raman, 2100–3600 m (Aug. 4, 1972).

Distr. Himalaya (Kumaon to Nepal and Sikkim).

Indigofera Dosua Buch.-Ham. ex D. Don: Fl. E. Himal. **2**: 66 (1971).

NEPAL. Dunche–Shyaprubensi, 1600 m (Jun. 26, 1970, fl.); Dingla–Nessum, 800–1300 m (Jul. 2, 1972, fl.).

var. **tomentosa** Baker in Fl. Brit. Ind. **2**: 102 (1876).

I. stachyodes Lindley: Fl. E. Himal. 158 (1966).

NEPAL. Phulchoki, 2400 m (Jul. 15, 1970, fl.); Gram–Dunche, 1900 m (Aug. 21, 1972).

DARJEELING. Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972).

SIKKIM. Singhik–Phyang La, 1500–1900 m (Jul. 1, 1969).

BHUTAN. Ratsoo–Samtengang, 2700 m (Apr. 25, 1967).

Indigofera hebepetala Benth. ex Baker in Fl. Brit. Ind. **2**: 101 (1876)–Ali in Bot. Not. **111**: 572 (1958).

var. **glabra** Ali, l.c. 572 (1958).

NEPAL. Phulchoki, 2400–2700 m (Jun. 23, 1967; May 28, 1972 & July 15, 1972, all fl.); Thale–Trisuli Khola, 2000–2200 m (Jun. 3, 1969, fl.); Trisuli Khola–Gosainkund, 2000–3000 m (Jun. 4, 1969, fl.).

BHUTAN. Dotanang–Thimphu, 2500 m (May 28, 1967, fl.); Thimphu–Chimakhothi (Jun. 1, 1967, fl.).

Distr. Himalaya (Kashmir to Bhutan).

Indigofera heterantha Wall. ex Brandis, For. Fl. N. W. & C. Ind. 135 (1874)–Ali in Bot. Not. **111**: 566 (1958).

I. Gerardiana Wall. ex Baker in Fl. Brit. Ind. **2**: 100 (1876), cum var. *heterantha* (Wall.) Baker.

NEPAL. Chitre–Dor, 2300–2600 m (Jun. 6, 1972, fl.).

BHUTAN. Dochu La, 3200 m (May 30, 1967, fl.); Thimphu–Chimakhothi (Jun. 1, 1967, fl.).

Distr. E. Afghanistan, Himalaya (Kashmir to Bhutan), Assam, and China.

Lathyrus sativus L.: Fl. E. Himal. 158 (1966).

NEPAL. Pokharatar–Tarpu Ghat, 450 m, in rice paddy (Jan. 12, 1970, fl.).

Lespedeza cuneata (Du Mont. d. Cours) G. Don, Gen. Syst. **2**: 307 (1832)–Nakai, Lesp. Jap. & Korea 98 (1827)–Ohwi, Fl. Jap. 680 (1953); ed Engl. 560 (1965); ed. rev. 791 (1965).

Hedysarum sericeum Thunb., Fl. Jap. 287 (1784), non Mill.

Anthyllis cuneata Du Mont. d. Cours, Bot. Cult. **6**: 100 (1811).

Aspalathus cuneata D. Don, Prodr. Fl. Nepal. 246 (1825).

Indigofera chinensis Vogel in Nov. Act. Acad. Leop.-Carol. Nat. Cur. **19**, suppl. **1**: 14 (1843), fide Merrill in Journ. Arn. Arb. **18**: 69–70 (1937).

Lespedeza argyrea Sieb. et Zucc. in Abh. Akad. Muench. 4, **2**: 120 (1843).

L. sericea (Thunb.) Miq., Ann. Mus. Bot. Lugd.-Bat. **3**: 49 (1867)–Baker in Fl. Brit. Ind. **2**: 142 (1879)–Schindler in Engler, Bot. Jahrb. **49**: 597 (1913).

L. juncea var. *sericea* (Thunb.) Forbes et Hemsl. in Journ. Linn. Soc. **23**: 181 (1887)–Matsum. in Bot. Mag. Tokyo **16**: 71 (1902).

L. juncea subsp. *sericea* (Thunb.) Steen. in Nov. Guin. **6**: 280 (1955)–Backer et Bakh. f., Fl. Java **1**: 613 (1963).

BHUTAN. Choojom–Wangdu Phodrang, 1450–1500 m (Apr. 27, 1967, old fr.); Thimphu, 2450 m (Apr. 30, 1967, old fr.).

Distr. Afghanistan, Himalaya, Assam, China, Formosa, Manchuria, Korea, Ryukyu, Japan, Malaysia, and N. Australia.

Lespedeza juncea (L. f.) Pers., Syn. Pl. **2**: 318 (1807)–Maxim. in Act. Hort. Petrop. **2**: 370 (1873)–Baker in Fl. Brit. Ind. **2**: 142 (1876)–Schindler in Engler, Bot. Jahrb. **49**: 604 (1913).

Hedysarum junceum L. f., Decas. **1**: 7, t. 4 (1762)–L., Sp. Pl. ed. 2, 1053 (1763).

forma **variegata** (Camb.) Ohashi, stat. nov.

L. variegata Cambess in Jacq., Voy. **4**, Bot. 42, t. 50 (1844)–Schindler, l.c. **49**: 600 (1913).

L. sericea (Thunb.) Miq. var. *longepetiolata* Prain in Journ. Asiat. Soc. Beng. **66** (2): 374 (1897).

L. juncea var. *variegata* (Camb.) Ali in Biologia **12**: 41 (1966).

NEPAL. Shyaprubensi–Tangjet, 1500–2240 m (Jun. 27, 1970, fl.).

Distr. sp. Afghanistan, Himalaya (Kashmir to Nepal), China, E. Siberia, Korea, and Japan.

Lotus corniculatus L., Sp. Pl. ed. 1, 775 (1753)–Baker in Fl. Brit. Ind. **2**: 91 (1876)–Kitamura, Fl. Afghan. 235 (1960)–Fl. Phulchoki & Godawari 29 (1969)–Ohashi et Tateishi in Journ. Jap. Bot. **49**: 73 (1974).

var. **japonicus** Regel, Index Sem. Hort. Petrop. 23 (1864)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 166 (1955).

L. japonicus (Regel) K. Larsen in Bot. Tidsskr. **52**: 13 (1955).

NEPAL. Langtang Gorge–Langtang, 2800 m (Jul. 12, 1970); Shyaprubensi–Dunche, 1500–2000 m (Jul. 19, 1970).

Distr. E. Afghanistan, Himalaya, China, Formosa, Korea, Ryukyus, and Japan.

Lotus corniculatus varies greatly in gross morphology but is roughly characterized as follows: Plants prostrate or ascending, 5–40 cm long; leaflets narrowly obovate or narrowly oblong, 3–10 mm wide, usually not more than 3 times as long as wide; corolla (9–)10–16 mm long; and calyces (4–)5–8 mm long. The species is distributed widely in the Old World and the plants of the species in Japan have usually been treated as a variety, var. *japonica*. Cytologically *L. corniculatus* includes diploid and tetraploid races. The Japanese variety is known as diploid (2n=12), while the typical *corniculatus* is reported as tetraploid (2n=24). Based on these cytological data var. *japonica* sometimes regarded as a distinct species. However, I cannot agree with the treatment. In geographical distribution, "*japonicus*" is distributed not only Japan but also the area from east Afghanistan through the Himalayas to China and Korea. The morphological distinctions between "*japonicus*" and "*corniculatus*" are, moreover, somewhat obscure, though both are usually distinguishable from each other by the combination of several characters as follows:

Inflorescences 1–3(–4)-flowered; calyx-teeth apparently longer than or rarely as long as the calyx-tube; stems and leaves almost glabrous .... var. *japonicus*

Inflorescences (1–)2–7-flowered; calyx-teeth shorter to a little longer than the calyx-tube; stems and leaves pubescent or rarely glabrous ...... var. *corniculatus*

Macrotyloma uniflorum (Lam.) Verdcourt in Kew Bull. **24**: 322 & 401 (1970).

Dolichos uniflorus Lam., Encycl. Méth. **2**: 299 (1786).

D. biflorus L. sensu Baker in Fl. Brit. Ind. **2**: 210 (1876).

NEPAL. Phusri, 450 m, cult. (Oct. 16, 1963, fr.); Helok, 1500 m, cult. (Nov. 7, 1963, fr.); Birwa–Yektin, 1700–2800 m, cult. (Nov. 28, 1963, fr.).

Distr. Tropics of Asia and Africa.

Our specimens of the species all belong to var. *uniflorum*.

Mezoneurum cucullatum (Roxb.) Wight et Arn.: Fl. E. Himal. 158 (1966).

NEPAL. Sukaura–Arughat Bazar, 500 m (Jan. 9, 1970, fl.); Dunche–Shyaprubensi, 1500–2000 m (Jun. 26, 1970, fl.); Lothar, 210 m (Nov. 18, 1970, fl. & young fr.); Godawari–Phulchoki, 1700 m (Sep. 6, 1972).

SIKKIM. Singhik, 1500 m (Jul. 1, 1969, fl.).

Millettia auriculata Baker ex Brandis: Fl. E. Himal. 158 (1966).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972, fl.).

Millettia cinerea Benth.: Fl. E. Himal. 159 (1966).

NEPAL. Bagdeo–Saraswati, north of Nijgar, 400–420 m (Nov. 14, 1970).

Distr. Himalaya (Nepal to Bhutan), N. Assam, N. Burma, and Yunnan.

Millettia Prainii Dunn in Journ. Linn. Soc. **41**: 174 (1912).

M. glaucescens Kurz sensu Prain in Journ. Asiat. Soc. Beng. **66** (2): 362 (1897), p.p., excl. specim. cit. Malay.

Derris thyrsiflora (Benth.) sensu Ohashi in Fl. E. Himal. 149 (1966), p.p.

DARJEELING. Peshok, 900 m (Apr. 27, 1960, fl.).

Distr. E. Himalaya (E. Nepal and Sikkim).

Mimosa rubicaulis Lam.: Fl. E. Himal. 159 (1966).

NEPAL. Pokhara, 900 m (Jun. 18, 1967, fl.); Sanguri Bhanjyang–Dhara Pani, 1000–1300 m (Jun. 2 & Jul. 10, 1972, fl.); Bir Gaon, 1600 m (Jul. 1, 1972, fl.); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

DARJEELING. Lopchu–Tista, 400–800 m (Aug. 10, 1972).

BHUTAN. Phuntsholing, 900–1200 m (Apr. 3, fl. & Jun. 2, 1967, fl.).

Oxytropis lapponica (Wahl.) Gay, Fl. Dan. **10**: 30 (1827)–Gaud., Fl. Helvet. **4**: 545 (1829)–Baker in Fl. Brit. Ind. **2**: 137 (1876).

Phaca lapponica Wahl., Veg. Helv. 131 (1813), in nota–DC., Prodr. **2**: 274 (1825).

var. **Jacquemontiana** Benth. ex Baker, l.c. 137 (1876).

NEPAL. Samdan–Slesa, 4500 m (Jun. 24, 1972, fl.).

var. **lapponica**

NEPAL. Samdan, 4400 m (Jun. 24, 1972, fl.).

var. **xanthantha** Baker, l.c. 137 (1876).

NEPAL. Lama Chungbu–Samdan, 4300 m (Jun. 24, 1972, fl.).

Distr. sp. Mountains of Europe, Himalaya, and Siberia.

Oxytropis microphylla (Pall.) DC., Astr. 83 (1802); Prodr. **2**: 279 (1825)–Baker in Fl. Brit. Ind. **2**: 139 (1876)–Shishkin in Fl. USSR **13**: 216 (1938)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 167 (1955).

Phaca microphylla Pall., Reise **3**: 744 (1776).

Astragalus microphyllus Pall., Sp. Astr. 92 (1800).

Oxytropis chiliophylla Royl., Ill. Bot. Himal. **1**: 198 (1835).

BHUTAN. Seanchu Passa–Gokhu La–Chabecha, 3800–4400 m (May 21, 1967, fl.).

Distr. Himalaya (Kashmir to Bhutan), Mongol, and E. Siberia.

Parochetus communis Buch.-Ham. ex D. Don: Fl. E. Himal. 160 (1966); **2**: 67 (1971).

DARJEELING. Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972, fl.); Phalut–Singalila, 3600–3700 m (Aug. 3, 1972, fl.).

Phaseolus coccineus L., Sp. Pl. ed. 1, 724 (1753).

DARJEELING. (Jul. 25, 1972, fl.); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972, fl.).

Distr. Cultivated widely in temperate regions of the world.

Phaseolus lunatus L.: Fl. E. Himal. 160 (1966), p.p., incl. specim. cit. Nov. 26 & Nov. 27, 1963, cet. excl.

NEPAL. Dhara Pani–Dharan, 400–1300 m (Jul. 10, 1972, fl. & young fr.).

Phaseolus vulgaris L., Sp. Pl. ed. 1, 723 (1753)–Baker in Fl. Brit. Ind. **2**: 200 (1876).

NEPAL. Teku Nala–Dhankuta, 1200 m, cult. (Jun. 4, 1972, fl.); Dingla, 1000 m, cult. (Jul. 2, 1972).

Distr. Cultivated widely in the tropical and temperate regions of the world.

Piptanthus nepalensis (Hook.) D. Don: Fl. E. Himal. 161 (1966); **2**: 67 (1971).

NEPAL. Yatumbal–Oo Kharka, 2700–3400 m (Jun. 30, 1970, fl.); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Pithecolobium bigeminum (L.) Benth. in Hook., Lond. Journ. Bot. 206 (1844)–Baker in Fl. Brit. Ind. **2**: 303 (1878).

Mimosa bigemina L., Sp. Pl. ed. 1, 517 (1753).

NEPAL. Saju Khola–Dingla, 1000–1400 m, (Jul. 1, 1972, no. 727181, fr.).

Distr. E. Himalaya, India, and Ceylon.

Pueraria peduncularis (Benth.) Graham [in Wall., Cat. no. 5354 (1831–32), comb. nud.] ex Benth. in Journ. Linn. Soc. **9**: 124 (1867): Fl. E. Himal. 162 (1966).

Neustanthus peduncularis Benth. in Miq., Pl. Jungh. 235 (1852).

NEPAL. Khanging–Langtang Gorge, 2300–2800 m (Jul. 11, 1970, fl.); Thale–Thale Bisauna, 2300 m (Sep. 10, 1970); Phulchoki, 2200–2700 m (Jul. 15, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

BHUTAN. Thimphu–Chimakhothi (Jun. 1, 1967, fl.).

Rhynchosia minima (L.) DC., Prodr. **2**: 385 (1825)–Baker in Fl. Brit. Ind. **2**: 223 (1876).

Dolichos minimus L., Sp. Pl. ed. 1, 726 (1753).

BHUTAN. Choojom, 1500 m (Apr. 27, 1967).

Distr. Tropics.

Shuteria vestita Wight et Arn.: Fl. E. Himal. 163 (1966).

var. **densiflora** (Benth.) Baker in Fl. Brit. Ind. **2**: 182 (1876):

BHUTAN. Tashiling–Tongsa, 2200 m (Apr. 16, 1967, old fr.).

var. **involucrata** (Wight et Arn.) Baker, l.c. 182 (1876).

S. involucrata Wight et Arn., Prodr. 207 (1834)–Collett, Fl. Siml. 137 (1921).

NEPAL. Phulchoki, 2400 m (Jun. 26, 1967); Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972).

Smithia sensitiva Sit.: Fl. E. Himal. 164 (1966).

NEPAL. Chitlang–Thankot, 2000 m (Sep. 4, 1970); Thale–Thale Bisauna, 2050–2750 m (Sep. 10, 1970).

Spatholobus parviflorus (Roxb.) O. Kuntze: Fl. E. Himal. 164 (1966).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972, old fr.).

Tadehagi triquetrum (L.) Ohashi

subsp. **pseudotriquetrum** (DC.) Ohashi in Ginkgoana **1**: 295, pl. 42b (1973).

Pteroloma triquetrum (L.) Benth.: Fl. F. Himal. 162 (1966).

P. triquetrum subsp. *pseudotriquetrum* (DC.) Ohashi: Fl. E. Himal. **2**: 67 (1971).

NEPAL. Arughat Bazar–Majenda, 450–600 m (Jan. 9, 1970, fr.); Barabise–Thale, 800–2000 m (Sep. 9, 1970, fr.); Bainse, 600 m (Aug. 19, 1972, fr.).

Thermopsis barbata Royle: Fl. E. Himal. **2**: 67 (1971).

NEPAL. Kyangjing–Langtang Gorge, 3000–3800 m (Jul. 16, 1970).

Trigonella Emodi Benth. in Royle, Ill. Bot. Himal. 197 (1835)–Baker in Fl. Brit. Ind. **2**: 88 (1876)–Kitamura, Fl. Afghan. 242 (1960).

Botryolotus cachemyrianus Jaub. et Spach., Illust. **1**: 125 (1843).

T. cachemiriana Camb. in Jacq., Voy. **4**, Bot. 36, t. 41 (1844).

T. rhytidocarpa Boiss. et Bal., Diagn. ser. 2, **6**: 44 (1859).

NEPAL. Godawari–Phulchoki, 2100–2800 m (May 29 & Jun. 10, 1969, fl.; Jul. 15, 1972, fl.); Tangjet–Chilime, 1800 m (Jun. 28, 1970, fl.); Langtang Gorge–Langtang, 2800–3400 m (Jul. 12, 1970); Trisuli Khola–Singum Gompa, 2800 m (Aug. 22, 1972).

Distr. Asia Minor, Iran, Afghanistan, and Himalaya (Kashmir to Nepal).

Uraria lagopus DC. in Ann. Sci. Nat. 100 (Jan. 1825); Prodr. **2**: 324 (Nov. 1825)–Baker in Fl. Brit. Ind. **2**: 156 (1876)–Prain in Journ. Asiat. Soc. Beng. **66** (2): 381 (1897)–Fl. Phulchoki & Godawari 31 (1969).

Hedysarum arboreum (Buch.-Ham.) D. Don, Prodr. Fl. Nepal. 243 (Feb. 1825).

U. arborea (D. Don) G. Don, Gen. Syst. **2**: 287 (1832)–Walp., Rep. Suppl. **1**: 889 (1843)–Schindler in Fedde, Rep. Beih. **49**: 363 (1928).

var. **lagopus**

NEPAL. Taplejung–Garhi Danra, 2000 m (Nov. 3, 1963, fr.); Tuwa–Taplethok, 1400–1800 m (Nov. 5, 1963, fr.); Ghatte–Khebang, 1600–2400 m (Nov. 19, 1963, fr.).

BHUTAN. Tongsa–Tashiling, 2200–2300 m (Apr. 19, 1967).

Distr. var. Himalaya (Punjab to Bhutan) and Assam.

var. **neglecta** (Prain) Ohashi, comb. nov.

U. neglecta Prain in Journ. Asiat. Soc. Beng. **66** (2): 382 (1897)–Schindler, l.c. **49**: 366 (1928).

NEPAL. Nagarjun, 1500 m (Mar. 1, 1969, fr.).

Distr. var. Himalaya (Kumaon to Nepal) and India (Bengal and Assam).

Uraria rufescens (DC.) Schindler in Fedde, Rep. **21**: 14 (1925)–Ohashi, Fl. E. Himal. 164 (1966), excl. specim. cit.

U. hamosa (Roxb.) Sweet [Hort. Brit. ed. 2, 149 (1830), comb. nud.] ex Wight et Arn., Prodr. 222 (1834)–Wight, Icon. **1**: t. 284 (1840)–Baker in Fl. Brit. Ind. **2**: 156 (1876).

NEPAL. Makwampur Garhi–Dunge Garhi, 700–1000 m (Nov. 16, 1970, fr.).

In the first report this species was listed erroneously on the specimens of *U. lagopodioides*.

Vicia angustifolia L.: Fl. E. Himal. 165 (1966).

V. sativa subsp. *nigra* (L.) Ehrh. in Hannover. Mag. **1780** (15): 229 (1780)–Ball in Fl. Europ. **2**: 134 (1968).

BHUTAN. Thimphu, 2450 m (Apr. 7, 1967, fl. & fr.); Yuwak–Wangdu Phodrang, 1600 m (Apr. 9, 1967, fl. & fr.); Tongsa–Tratang, 2000–2500 m (Apr. 18, 1967).

Vicia hirsuta (L.) S. F. Gray: Fl. E. Himal. 165 (1966).

BHUTAN. Tongsa–Tratang, 2200–2700 m (Apr. 18, 1967, fl. & fr.); Dotanang–Tabab, 2550–2700 m (May 28, 1967, fl. & fr.).

Vicia tetrasperma (L.) Schreber, Spicil. Fl. Lips. 26 (1771)–Baker in Fl. Brit. Ind. **2**: 177 (1876).

BHUTAN. Thimphu, 2450–2800 m (Apr. 7, 1967, fl. & fr.).

Distr. Native in Europe and Asia, and naturalized in N. America.

Vigna angularis (Willd.) Ohwi et Ohashi

var. **nipponensis** (Ohwi) Ohwi et Ohashi in Journ. Jap. Bot. **44**: 30 (1969)–Verdcourt in Kew Bull. **24**: 558 (1970).

Phaseolus nipponensis Ohwi in Journ. Jap. Bot. **13**: 435 (1937).

P. angularis (Willd.) W. F. Wight var. *nipponensis* (Ohwi) Ohwi in Act. Phytotax. Geobot. **12**: 110 (1943).

Azukia angularis (Willd.) Ohwi var. *nipponensis* (Ohwi) Ohwi [Fl. Jap. 691 (Mar. 1953), comb. nud.] in Bull. Nat. Sci. Mus. Tokyo no. 33, 77 (Jul. 1953).

P. angularis f. *nipponensis* (Ohwi) Kitamura [in Kitamura et Murata, Colour. Ill. Herb. Pl. Jap. **2** (Choripetalae): 116, pl. 28, f. 232 (1961), comb. nud.] in Act. Phytotax. Geobot. **20**: 199 (1962).

NEPAL. Godawari, 1500 m (Sep. 18, 1963, no. 6301759, fl. & young fr.).

Distr. var. Himalaya (Nepal), China, Korea, and Japan.

Vigna umbellata (Thunb.) Ohwi et Ohashi in Journ. Jap. Bot. **44**: 31 (1969)–Verdcourt in Kew Bull. **24**: 560 (1970).

Dolichos umbellatus Thunb. in Trans. Linn. Soc. **2**: 339 (1794).

Phaseolus pubescens Blume: Fl. E. Himal. 160 (1966).

NEPAL. Dingla–Doban, 800–1000 m (Jul. 2, 1972, no. 724022, fl. & young fr.).

Vigna unguiculata (L.) Walp., Rep. Bot. Syst. **1**: 779 (1842)–Piper in U. S. Dept. Agric. Bur. Pl. Ind. Bull. no. 229, 7 (1912)–Wilczek in Fl. Congo Belge **6**: 387, pl. 30 (1954)–Verdcourt in Kew Bull. **24**: 542 (1970).

Dolichos unguiculatus L., Sp. Pl. ed. 1, 725 (1753).

D. sinensis L., Herb. Amb. 23 (1754).

V. sinensis (L.) Savi ex Hassk.: Fl. E. Himal. 165 (1966).

var. **cylindrica** (L.) Ohashi, stat. nov.

Phaseolus cylindricus L., Herb. Amb. 23 (1754).

Dolichos Catjang Burm. f., Fl. Ind. 161 (1768).

D. cylindricus (L.) Moench, Meth. Suppl. 48 (1802).

Vigna Catjang (Burm. f.) Walp. in Linnaea **13**: 533 (1839).

V. sinensis var. *Catjang* (Burm. f.) Chiov. in Ann. Inst. Bot. Roma **8**: 438 (1908)–T. Ito in Encycl. Jap. (Sanseido) **4**: 804 (1910), ut var. *Catiang* (Burm.) T. Ito–Makino in Journ. Jap. Bot. **8**: 18 (1932), ut var. *Catiang* (L.) Yatabe.

V. cylindrica (L.) Skeels in U. S. Dept. Agric. Bur. Pl. Ind. Bull. no. 282, 32 (1913).

V. unguiculata subsp. *cylindrica* (L.) van Eseltine in Hedrick, Vegetables New York **1** (2): 11 (1931)–Verdcourt, l.c. 544 (1970).

V. unguiculata subsp. *Catjang* (Burm. f.) Chiov., Raccolte Bot. Missionari Consolata nel Kenya 35 (1935), fide Verdcourt, l.c. 544 (1970).

NEPAL. Dingla–Doban, 1000 m, cult. (Jul. 2, 1972, nos. 724023, 724024 & 724025, fl.).

var. **sesquipedalis** (L.) Ohashi, stat. nov.

Dolichos sesquipedalis L., Sp. Pl. ed. 2, 1019 (1763).

Vigna sinensis var. *sesquipedalis* (L.) Ascherson et Schweinf., Ill. Fl. Egypt in Mem. Inst. Egypt. **2**: 69 (1889)–Makino in Journ. Jap. Bot. **8**: 18 (1932), ut var. *sesquipedalis* (L.) Koern.

V. sesquipedalis (L.) Fruhw., Anbau Hülsenfr. 254 (1898).

V. sinensis form. *Dschiuroku* T. Ito, l.c. 804 (1910).

V. sinensis subsp. *sesquipedalis* (L.) van Eseltine, l.c. 11 (1931).

V. Catiang var. *sinensis* form. *sesquipedalis* (L.) Makino, Ill. Fl. Nippon 404 (1940).

V. unguiculata subsp. *sesquipedalis* (L.) Verdcourt in Davies, Fl. Turkey **3**: 266 (1970); in Kew Bull. **24**: 544 (1970).

NEPAL. Dingla–Nessum, 800–1300 m, cult. (Jul. 2, 1972, no. 724026, fl.).

var. **unguiculata**

Dolichos unguiculatus L., Sp. Pl. ed. 1, 725 (1753).

D. biflorus L., l.c. 727 (1753).

D. sinensis L., Herb. Amb. 23 (1754), fide Verdcourt, l.c. 544 (1970).

Vigna sinensis (L.) Savi ex Hassk., Cat. Pl. Hort. Bogor. 279 (1844), sensu str.

V. sinensis subsp. *sinensis*: Mansf., Prodr. Enum. Sp. Pl. Agri-Hort. 209 (1959).

V. unguiculata subsp. *unguiculata*: Verdcourt in Kew Bull. **24**: 543 (1970).

NEPAL. Dingla–Doban, 800–1000 m, cult. (Jul. 2, 1972, no. 724027, fl.).

Dr. B. Verdcourt (1970–71) published a series of important papers on the tribe Phaseoleae. All the species of *Vigna* cited in the present enumeration were treated soundly in his paper, but, based on my observation on a number of fresh material cultivated widely in Japan and E. Himalaya, several infraspecific taxa of *Vigna unguiculata* may be better to regard as varieties. The three varieties have usually been distinguished by the difference in length of the mature legume, but the character varies often greatly. Differences in calyces between them are, however, apparently more important as a diagnostic character.

Vigna vexillata (L.) A. Rich., Hist. Fis. Pol. Nat. Isla Cuba **11**: 191 (1845); Ess. Fl. Cuba 440 (1846)–Baker in Fl. Brit. Ind. **2**: 206 (1876)–Wilczek in Fl. Congo Belge **6**: 379, pl. 29, fig. 18c (1954)–Verdcourt in Kew Bull. **24**: 553 (1970).

Phaseolus vexillatus L., Sp. Pl. ed. 1, 724 (1753).

P. pulniensis Wight, Icon. **1**: t. 202 (1839).

var. **angustifolia** (Schumach. et Thonn.) Baker in Fl. Trop. Afr. **2**: 200 (1871)–Verdcourt in Kew Bull. **24**: 554 (1970).

Plectrotropis angustifolia Schumach. et Thonn. in Schumach., Beskr. Guin. Pl. 338 (1827).

Phaseolus angustifolius Grah. in Wall., Cat. no. 5596 (1831–32), nom. nud.

Phaseolus fusiformis Grah. in Wall., l.c. no. 5607 (1831–32), nom. nud.

NEPAL. Sim Chotala–Gram, 900–1900 m, cult. (Aug. 20, 1972, no. 724021, fl.).

Distr. Tropics and subtropics of Asia, Australia and Africa.

Zornia gibbosa Spanoghe var. **gibbosa**: Fl. E. Himal. 165 (1966).

NEPAL. Barabise–Thale, 850–2050 m (Sep. 9, 1970).

GERANIACEAE (by Hiroshi Hara)

Geranium Donianum Sweet, Geran. **4**: sub t. 338 (1827)–Wallich, Cat. no. 8565 (1847–48)–Knuth in Engl., Pfl.-reich IV-129, Ht. **53**: 141 (1912).

G. multifidum (non Sweet, Feb. 1825) D. Don, Prodr. Fl. Nepal. 207 (Feb. 1825).

G. stenorrhizum Stapf in Bot. Mag. sub t. 9092 (1926), e typo.

NEPAL. Mul Kharka–Yatumbal, 3300 m (Jul. 7, 1970); Saju Pokhari–Topke Gola, 4400–3600 m (Jun. 16, 1972, fl.); Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972, no. 723181, fl.); Phujeng La–Topke Gola, 3900 m (Jun. 27, 1972, fl.); Singum Gompa–Gosainkund, 3300–4000 m (Aug. 23, 1972, no. 721838, fl. purple).

BHUTAN. Chomolhari Chakan, 4150 m (Nishioka, Sep. 6, 1966).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

The name *Geranium multifidum* seems to have been published on the same date by D. Don and Sweet independently, but, as Sweet first noticed the fact and renamed D. Don's species as *G. Donianum*, his treatment has been followed.

Geranium Lambertii Sweet: Hara, Fl. E. Himal. **2**: 68 (1971). [Plate 4c]

NEPAL. Oo Kharka–Mul Kharka, 3500 m (Jul. 1, 1970, fl. white with purple veins); Mul Kharka, 3800 m (Jul. 7, 1970, fl.); Tingoang, Kalingchok, 3200 m (Sep. 12, 1970, fl. pale pink); Singum Gompa, 3200 m (Aug. 22, 1972, no. 721827, fl. pale pink).

Distr. Himalaya (Kumaon to Bhutan) and S. Tibet.

Geranium Nakaoanum Hara in Kihara, Fauna Fl. Nepal Himal. 276, f. 83 (1955).

NEPAL. Mul Kharka–Yatumbal, 3800–2700 m (Jul. 7, 1970, fl.); Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972, no. 723126, fl.); Kipuphu–Topke Gola, 4800–3600 m (Jun. 27, 1972, fl.); Gosainkund–Gopte, 3800 m (Aug. 25, 1972, no. 723128, fr.).

Distr. E. Himalaya (Nepal, Bhutan).

Geranium polyanthes Edgew. et Hook. f.: Hara, Fl. E. Himal. 167 (1966).

NEPAL. Topke Gola, 3600 m (Jun. 19, 1972, fl.); Thudam, 3400 m (Jun. 23, 1972, fl.); Topke Gola–Shewaden, 3400 m (Jun. 28, 1972, no. 723897, fl.); Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972, fl.).

DARJEELING. Tonglu, 3000 m (Jul. 30, 1972, fl.) Tonglu–Sandakphu, 3000–3600 m (Jul. 31, 1972, fl.); Sandakphu, 3600 m (Aug. 1, 1972, fl.).

Distr. Himalaya (Kumaon to Bhutan) and S. Tibet.

Geranium procurrens P. F. Yeo in Bot. Mag. n.s. t. 644 (1973). [Plate 4d]

G. Lambertii Sweet sensu Hara, Fl. E. Himal. 167 (1966).

G. Lambertii var. *Backhousianum* Hara, Fl. E. Himal. **2**: 68 (1971), excl. basionym.

NEPAL. Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972, fl.); Mangen–Khodang Danda, 3100–2500 m (Aug. 28, 1972, fl.).

Distr. Himalaya (Nepal, Sikkim).

As I pointed out in 1971, this plant is clearly distinguished from *G. Lambertii*, and in 1972 I comfirmed the differences in their native habitats. The two species are also different in the direction of the fruiting pedicels. According to Dr. Yeo, *G. Backhousianum* Regel is not a native of Nepal, and is identical with *G. psilostemon* Ledeb. (misprinted as *spilostemon* by Yeo) of Caucasus.

Geranium refractum Edgew. et Hook. f. in Fl. Brit. Ind. **1**: 428 (1874)–Knuth, l.c. 135, f. 19 A–D (1912). [Plate 4e]

NEPAL. Thudam–Lama Chungbu, 4000–4100 m (Jun. 23 & 24, 1972, fl. white); Thudam–Kipuphu, 3400–4500 m (Jun. 26, 1972, fl.).

BHUTAN. Cheka, 3750 m (Nishioka, Jun. 22, 1966, fl.).

Distr. Himalaya (Nepal to Bhutan) and S. Tibet.

Geranium Wallichianum D. Don ex Sweet, Geran. **1**: t. 90 (1821)–Fl. Brit. Ind. **1**: 430 (1874)–Knuth, l.c. 194 (1912).

NEPAL. Thale Bisauna, 2800 m (Sep. 10, 1970, fl.); Thale Bisauna–Tingoang, 3100 m (Sep. 11, 1970, fl.); Trisuli Khola–Singum Gompa, 2600 m (Aug. 22, 1972, fl.).

Eight perennial species of *Geranium* collected by our Expeditions in Eastern Himalaya are clearly distinguished as follows:

1 Peduncles crowded at the top of erect stems, subumbellate, 1-flowered, often short (5–20 mm), erect in fruit. Mericarp-bodies coarsely reticulate. Flowers red-purple 1.5–3 cm in diameter, petals obliquely ascending in the lower part. Sepals clothed with long spreading soft glandular hairs. Stigmatic branches ca. 1 mm long. Leaves orbicular in outline, deeply 5–9-lobed, lobes obovate incised at the top, ultimate lobules obtuse. Stipules connate .... *G. polyanthes*

Peduncles axillary solitary, 2- or 1-flowered. Mericarp-bodies smooth (not reticulate), often hirsute 2

2 Flowers small 1–1.5 cm in diameter, pale pink to rose-purple. Stigmatic branches 1–1.3 mm long. Ovary with very minute hairs. Sepals 4.5–6 mm long. Peduncles 2- or 1-flowered, with retrorse eglandular hairs. Stipules free linear-lanceolate. Leaves 1–4 cm long, lobes rhombic with ovate obtuse or acutish teeth .... *G. nepalense*

Flowers large or medium-sized 2.5–6 cm in diameter. Stigmatic branches 1.5–6 mm long. Sepals 6–14 mm long 3

3 Stipules connate, ovate or oblong-ovate, 6–15 mm long. Flowers 2.5–4 cm in diameter 4

Stipules free, lanceolate or broad lanceolate, sometimes partially connate. Petals spreading, pink to dark red-purple 5

4 Flowers nodding, petals reflexed, white with purple veins. Pedicels densely clothed with spreading partly glandular hairs. Style slender ca. 4 mm long, branches ca. 3 mm long. Filaments 9–11 mm long. Leaves deeply 5–7-lobed, lobes broad rhombic deeply incised. Stipules oblong-ovate ....*G. refractum*

Flowers not nodding, petals spreading, rose–red-purple, white in the centre. Pedicels clothed with white long spreading or reflexed eglandular hairs. Style very short, branches 5–6 mm long. Filaments 5–7 mm long. Leaves 3–5-lobed, lobes broad rhombic often acuminate. Stipules ovate .... *G. Wallichianum*

5 Leaves deeply 7–9-lobed, terminal lobe shorter than the others, lobes ± obovate, deeply incised into linear or lanceolate narrow lobules. Flowers 2–3 cm in diameter. Sepals 6–10 mm long. Stigmatic branches 1.5–3 mm long 6

Leaves 5-lobed to 3/4 of the length, lobes rhombic, ultimate lobules ± ovate. Flowers 3–6 cm in diameter. Sepals 6–14 mm long. Ovary white-hirsute. Stigmatic branches 4.5–7 mm long 7

6 Peduncles 1-flowered, clothed with very short recurved hairs, bracts obtuse. Ovary minutely glandular-papillose. Mericarp glabrous. Sepals glabrescent. Filaments glabrous or ciliate, dilated in the lower part. Leaves orbicular in outline, glabrescent beneath, ultimate lobules more obtuse at the apex .... *G. Nakaoanum*

Peduncles 2-flowered, clothed with retrorse appressed stiff hairs, bracts acutish. Ovary densely covered with white stiff hairs. Sepals appressed white-hairy on midrib and near margins. Filaments long-ciliate. Leaves clothed with long stiff hairs on nerves beneath, ultimate lobules acutish.... *G. Donianum*

7 Flowers nodding, pink rarely white with purple veins, larger 4–6 cm in diameter. Sepals 10–14 mm long, clothed with long and short pointed hairs. Stigmatic branches ca. 7 mm long. Filaments 8–11 mm long, anthers 2.5–3.5 mm long. Peduncles elongate. Pedicels clothed with eglandular pointed hairs, deflexed in fruit. Bracts lanceolate 9–20 mm long. Stipules free 8–20 mm long.................................. *G. Lambertii*

Flowers not nodding, dark red-purple with the black centre, 3–4 cm in diameter. Sepals 6–8 mm long, clothed with long spreading soft glandular hairs.

Stigmatic branches 4.5–5 mm long. Filaments 5–7 mm long, anthers 1.5–2 mm long. Pedicels densely covered with long spreading soft mostly glandular hairs, ascending even in fruit. Bracts shorter 3–6 mm long. Stipules 4–9 mm long, free sometimes partially connate .... *G. procurrens*

RUTACEAE (by Hiroo Kanai)

Boenninghausenia albiflora (Hook.) Meissn.: Kanai in Fl. E. Himal. 169 (1966).

NEPAL. Baguwa, 900 m (Apr. 23, 1969); Dunche–Singum Gompa, 2800 m (Jun. 4, 1969); Phulchoki, 2400 m (Aug. 9, 1969); Tanguni–Chipling, 2000 m (Aug. 21, 1969); Bhuktani–Sukaura, 900 m (Jan. 8, 1970); Barabise–Thale, 1800 m (Sep. 9, 1970); Khosori Khabre, 2000 m (Sep. 12, 1970); Ramche, 1500 m (Aug. 20, 1972); Thale, 1900 m (Aug. 21, 1972); Gul Bhanjyang–Latsu, 2300 m (Aug. 29, 1972).

SIKKIM. Gangtok, 1800 m (Jun. 27, 1967).

BHUTAN. Thimphu, 2500 m (Apr. 7, 1967); Tongsa–Tongsa Bridge, 2200 m (Apr. 19, 1967); Kyebaka, 1600 m (Apr. 26, 1967); Zami Bridge–Gasa, 2400 m (May 13, 1967).

Clausena excavata Burm. f., Fl. Ind. 87 (1768)–Hook. f., Fl. Brit. Ind. **1**: 504 (1875)

NEPAL. Simra–Patlaia, 200 m (Apr. 17, 1969); Juleri, 300 m (Apr. 20, 1969); Dharan, 200 m (Jun. 1, 1972).

Distr. Tropical Himalaya (Nepal to Bhutan), India, Burma, and Malaysia.

Clausena pentaphylla DC., Prodr. **1**: 538 (1824)–Fl. Brit. Ind. **1**: 503 (1875).

NEPAL. Patlaia–Sakti Mohar Khola, 200 m (Apr. 18, 1969).

Distr. Tropical Himalaya (Kumaon to Nepal) and India.

Fagara oxyphylla (Edgew.) Engl.: Fl. E. Himal. 170 (1966).

NEPAL. Khiraule Bhanjyang–Lele Bhanjyang, 2000 m (Apr. 25, 1969); Sheopuri, 2700 m (Jun. 14, 1969); Tingoang–Harjung, 2400 m (Apr. 18, 1970); Gul Bhanjyang–Latsu, 2300 m (Aug. 29, 1972).

BHUTAN. Neylong–Charikhachor, 2400 m (Apr. 20, 1967); Tamji, 2200 m (May 13, 1967); Zami Bridge–Gasa, 2400 m (May 13, 1967); Dotanang, 2700 m (May 27, 1967).

Fagara tomentella (Hook. f.) Hand.-Mzt., Symb. Sin. **7**: 624 (1933).

Zanthoxylum tomentellum Hook. f., Fl. Brit. Ind. **1**: 493 (1875).

BHUTAN. Ratsoo–Ritang, 2100 m (Apr. 11, 1967); Tashiling–Tongsa Bridge, 2000 m (Apr. 16, 1967); Tongsa Bridge, 1900 m (Apr. 19, 1967); Ritang–Ratsoo, 2000 m (Apr. 23, 1967).

Distr. E. Himalaya (Sikkim and Bhutan).

Murraya Koenigii Spreng., Syst. Veg. **2**: 315 (1828)–Fl. Brit. Ind. **1**: 503 (1875).

NEPAL. Saraswati–Bakeya Khola, 500 m (Apr. 19, 1969).

Distr. Tropical Himalaya (Garhwal to Sikkim), India, and Ceylon.

Skimmia melanocarpa Rehd. et Wils.: Fl. E. Himal. 170 (1966).

NEPAL. Bagdwar, 2500 m (Dec. 31, 1969); Barati–Thale Bisauna, 2800 m (Apr. 16, 1970); Dunche–Singum Gompa, 2900 m (Aug. 22, 1972).

Zanthoxylum acanthopodium DC.: Fl. E. Himal. 171 (1966).

NEPAL. Dunche–Singum Gompa, 2300 m (Jun. 4, 1969); Mewa Khola–Papung, 2400 m (Jun. 29, 1972).

Bhutan. Tongsa–Tongsa Bridge, 1900 m (Apr. 19, 1967).

Zanthoxylum armatum DC.: Fl. E. Himal. 171 (1966).

Nepal. Godawari–Phulchoki, 2000 m (Jun. 23, 1967); Nagarkot, 2000 m (Jun. 24, 1967); Dunche–Singum Gompa, 3100 m (Jun. 4, 1969); Nigate Bhanjyang, 1900 m (Feb. 10, 1970); Shyaprubensi–Tangjet, 2000 m (Jun. 27, 1970); Mewa Khola–Papung, 2400 m (Jun. 29, 1972).

Bhutan. Wangdu Phodrang, 1500 m (Apr. 9. 1967); Tongsa–Tongsa Bridge, 1900 m (Apr. 19, 1967); Choojom–Wangdu Phodrang, 1500 m (Apr. 27, 1967); Tinlegang, 1950 m (May 4, 1967); Tamji–Zami Bridge, 2200 m (May 13, 1967).

OCHNACEAE (by Hiroo Kanai)

Ochna pumila Hamilt. in D. Don, Prodr. Fl. Nepal. 224 (1825)–Bennett in Fl. Brit. Ind. **1**: 524 (1875).

Nepal. Simra–Patlaia, 200 m (Apr. 17, 1969. Small shrub, 30 cm tall, usually not branched. Leaves involute when young. Petals yellow. Anthers brownish yellow).

Distr. Himalaya (Kumaon, Nepal, Sikkim), India, and Burma (Pegu).

POLYGALACEAE (by Hiroshi Hara)

Polygala sibirica L., Sp. Pl. ed. 1, 702 (1753).

var. **elegans** (Wall. ex Royle) Hara in Journ. Jap. Bot. **47**: 272 (1972).

P. myrsinites Royle, l.c. t. 19 A (Mar. 1834), nom. nud.

P. elegans Wall. [Cat. no. 4186 (1831), nom. nud.] ex Royle, Ill. Bot. Himal. 76 (Jun. 1834)–Chodat, Monogr. Polygal. **2**: 350, t. 28, f. 12 & 13 (1893).

P. sibirica L. sensu Bennett in Fl. Brit. Ind. **1**: 205 (1872), p.p.: Hara, Fl. E. Himal. **2**: 69 (1971).

Distr. E. Himalaya (Garhwal to Bhutan), ?Khasia, S. E. Tibet, and Manipur.

ANACARDIACEAE (by Hiroo Kanai)

Buchanania latifolia Roxb., Fl. Ind. ed. 2, **2**: 385 (1832)–Hook. f., Fl. Brit. Ind. **2**: 23 (1876).

Nepal. Simra–Patlaia, 2000 m (Apr. 17, 1969); Phurke Chour–Gothdanda, 600 m (Apr. 20, 1969).

Distr. Himalaya, India, and Burma.

This species is a tree, 10 m high, growing on dry south-faced slope with *Shorea robusta.*

Choerospondias axillaris (Roxb.) B. L. Burtt et A. W. Hill: Kanai in Fl. E. Himal. 186 (1966).

Nepal. Nagarjun, 1500 m (Apr. 7, 1969, anthers orange yellow).

Lanna Wordier (Roxb.) Adelber in Blumea **6**: 326 (1948).

Odina Wordier Roxb.: Fl. E. Himal. 186 (1966).

Nepal. Patlaia–Sakti Mohar Khola, 200 m (Apr. 18, 1969); Dhara Pani–Mohamabedi Khola, 700 m (Jun. 3, 1972, fr. greenish when young, then dark reddish, juicy).

Rhus insignis Hook. f.: Fl. E. Himal. 186 (1966).

Nepal. Saju Khola–Dingla, 1200 m (Jul. 1, 1972).

Rhus javanica L.: Fl. E. Himal 186 (1966).

Nepal. Phulchoki, 1700 m (Sep. 6, 1972).

Rhus parviflora Roxb., Fl. Ind. ed. 2, **2**: 100 (1832)–Hook. f., Fl. Brit. Ind. **2**: 9 (1876).

NEPAL. Doralghat, 700 m (Oct. 21, 1969).

Distr. W. Himalaya (Kumaon to Nepal) and India.

Rhus succedanea L. var. **sphaerocarpa** Hook. f., Fl. Brit. Ind. **2**: 12 (1876): Fl. E. Himal. 187 (1966), in nota.

NEPAL. Phulchoki, 2400 m (Apr. 11, 1969); Thale–Dunche, 2000 m (Jun. 3, 1969); Tanguni–Chipling, 2000 m (Aug. 21, 1969); Mane Gaon–Thale, 2000 m (Jun. 24, 1970); Yatumbal–Chilime Khola, 2300 m (Jul. 8, 1970); Tute–Dor, 2400 m (Jun. 6, 1972); Papung–Bir Gaon, 1700 m (Jun. 30, 1972); Thale–Dunche, 2000 m (Aug. 21, 1972); Pati Bhanjyang–Bhorlang, 2200 m (Aug. 30, 1972).

DARJEELING. Thame, 2000 m (Aug. 12, 1972).

Distr. sp. Himalaya, India, Burma, Thailand, Indo-China, Malaysia, China, Formosa, Ryukyu, and Japan.

Rhus Wallichii Hook. f.: Fl. E. Himal. 187 (1966).

NEPAL. Thale–Dunche, 2000 m (Jun. 3, 1969); Mane Gaon–Thale, 2000 m (Jun. 24, 1970); Nessum, 1300 m (Jul. 3, 1972).

Semecarpus Anacardium L. f.: Fl. E. Himal. 187 (1966).

NEPAL. Sim Chotala–Bainse, 800 m (Jun. 7, 1969); Bagdeo–Saraswati, 400 m (Nov. 14, 1970); Tamur Bridge–Teku Nala, 400 m (Jun. 3, 1972); Dingla–Doban, 700 m (Jul. 2, 1972).

This species is found in *Shorea robusta* forest.

CELASTRACEAE (by Hiroshi Hara)

Cassine glauca (Rottb.) O. Kuntze: Hara, Fl. E. Himal. 188 (1966).

NEPAL. Dharan–Sanguri Bhanjyang, 800 m (Jun. 2, 1972, no. 720119, fl. yellow green); Mohamabedi Khola–Dhara Pani, 800 m (Jul. 9, 1972, fl.).

Distr. Tropical Himalaya (Kashmir to Nepal), India, Ceylon, Indo-China, and Malaysia.

Euonymus amygdalifolius Franch. in Bull. Soc. Bot. France **33**: 453 (1886)–Blakelock in Kew Bull. **1951**: 280 (1951).

NEPAL. Topke Gola–Shewaden, 3100 m (Jun. 28, 1972, no. 723662).

Distr. Himalaya (Kumaon to Sikkim), N. Burma, S. Tibet, and W. China (Yunnan).

Reissantia arborea (Roxb.) Hara in Journ. Jap. Bot. **40**: 327 (Nov. 1965); Fl. E. Himal. 191 (1966)–Raju in Journ. Biol. Sci. **8**: 56 (Dec. 1965).

NEPAL. S. of Dharan, 200 m (Jul. 1, 1972, no. 723654, fl.); Dhara Pani–Teku Nala, 1000–300 m (Jun. 3, 1972, fl.).

Distr. Tropical Himalaya (Nepal to N. Assam), Khasia, N. Burma, and W. China.

SABIACEAE (by Hiroo Kanai)

Meliosma dilleniifolia (Wall.) Walpers: Hara, Fl. E. Himal. 194 (1966); **2**: 74 (1971).

NEPAL. Khirojet, 2300 m (Jun. 28, 1970, tree, 5 m high with fragile branches. Perianth 3 with 2 small and 1 large, pale yellowish white. Filament folded at its half way with

2 short projections at the folding. Folding of filament released and the filament spring outward dispersing pollen by a slight touch to the projection); Phulchoki, 2600 m (Oct. 20, 1970).

DARJEELING. Phalut–Ratho Chu, 2900 m (Aug. 4, 1972).

Sabia leptandra Hook. f. et Thoms.: Fl. E. Himal. 194 (1966); **2**: 74 (1971).

NEPAL. Mane Gaon–Thale, 2000 m (Jun. 24, 1970, fr. blue with minute punctuations. Sarcocarp blue).

Sabia paniculata Edgew. in Hook. f. et Thoms., Fl. Ind. **1**: 211 (1855)–Hook. f., Fl. Brit. Ind. **2**: 3 (1876).

NEPAL. Phurke Chour, 400 m (Apr. 20, 1969, climber, young fruits white).

Distr. Himalaya (Garhwal to Nepal). New to Nepal.

BALSAMINACEAE (by Hiroshi Hara)

Impatiens amplexicaulis Edgew. in Trans. Linn. Soc. **20**: 37 (1851)–Hook. f., Fl. Brit. Ind. **1**: 469 (1875); in Rec. Bot. Surv. Ind. **4**: 8 (1904).

NEPAL. Langtang–Kyangjing, 3600 m (Jul. 13, 1970); Thudam, 3400 m (Jun. 25, 1972, no. 720737, fl. pink).

Distr. Himalaya (Punjab to Nepal).

Impatiens arguta Hook. f. et Thoms.: Hara, Fl. E. Himal. 194 (1966); **2**: 74 (1971).

NEPAL. Chitre, 2400 m (Jul. 7, 1972, no. 721162, fl.).

DARJEELING. Ratho Chu–Raman, 2400 m (Aug. 4 1972, fl.); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972, fl.); Palmajua, 2200 m (Aug. 7, 1972, fl.).

Distr. E. Himalaya (E. Nepal to Bhutan), S. Tibet, Khasia, Manipur, Burma, and W. China (var.).

Impatiens bicornuta Wall.: Fl. E. Himal. 195 (1966); **2**: 75 (1971).

NEPAL. Thale–Dunche, 2000 m (Jun. 25, 1970, fl.); Phulchoki, 2500 m (Jul. 15, 1972, fl.); Gram–Dunche, 1900 m (Aug. 21, 1972, no. 721724, fl.); Khodang Danda–Latsu, 2300 m (Aug. 29, 1972, fl.).

DARJEELING. Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972, fl.).

var. **micrantha** Hara, var. nov.

Differt a typo floribus minoribus, labello 10–12 mm longo.

NEPAL. Dunche–Singum Gompa, 2000–2500 m (Kanai, Hara & Ohba, Aug. 22, 1972, no. 723214, fl. light pink. Holotype in TI).

Distr. sp. Himalaya (Garhwal to NEFA).

The colour of flowers is variable in this species. In Central Nepal, the flowers are generally rose-pink or light purple outside, but in the Darjeeling District, they are yellow tinged with brown-purple. Var. *micrantha* forms a separate colony from the typical one.

Impatiens cymbifera Hook. f., Fl. Brit. Ind. **1**: 474 (1875); in Rec. Bot. Surv. Ind. **4**: 14 & 20 (1905).

NEPAL. Trisuli Khola, 2065 m (Jun. 3, 1969, no. 69896, fl.).

SIKKIM. Lagyap, 2200 m (Hara & Pradhan, Sep. 13, 1964, fl.).

Distr. E. Himalaya (Nepal, Sikkim).

Hooker f. (1875) described this species in the original description apparently by mistake as 'spurless'. The type specimen at Kew collected from Lachoong, Sikkim (Hooker f. 1849) has slender curved spur 6–8 mm long, and it is clearly shown also in the drawing by Hooker f. himself on the type sheet.

Impatiens exilis Hook. f.: Fl. E. Himal. 195 (1966).

NEPAL. Dhara Pani, 1000 m (Jul. 10, 1972, no. 721226, fl.).

SIKKIM. Rumtek, Gangtok, 1800 m (Jun. 27, 1969, fl.); Gangtok-Middle Camp, 800–900 m (Jun. 28, 1969).

Distr. E. Himalaya (Nepal to Bhutan).

Impatiens falcifer Hook. f.: Fl. E. Himal. 195 (1966).

NEPAL. Mere Danda, 3200 m (Aug. 23, 1969, fl.); Oo Kharka, 3400 m (Jul. 7, 1970, fl.); Kuri–Charikot, 3250–2000 m (Sep. 29, 1970, fl.); Phulchoki, 2650 m (Jul. 15, 1972, fl.); Gopte–Thale Patil, 3400 m (Aug. 26, 1972, fl.).

DARJEELING. Tonglu–Sandakphu, 2900 m (Jul. 31, 1972, fl.).

Distr. E. Himalaya (Nepal, Sikkim).

The flowers are yellow with dark red spots or without spot.

Impatiens Gamblei Hook. f. in Rec. Bot. Surv. Ind. **4**: 15 & 20 (1905).

NEPAL. Tinjure Phedi–Tinjure, 2800 m (Jul. 6, 1972, no. 721126, fl. rose-purple).

DARJEELING. Tonglu, 3000 m (Jul. 30, 1972); Tonglu–Sandakphu, 3000–3500 m (Jul. 31, 1972); Sandakphu, 3500 m (Aug. 1, 1972).

Distr. E. Himalaya (E. Nepal, Sikkim).

Impatiens occultans Hook. f. in Rec. Bot. Surv. Ind. **4**: 17 & 22 (1905).

NEPAL. Thale Patil–Rock Shelter I, 3500–3270 m (Aug. 24, 1969, fl.); Gosainkund, 3900 m (Aug. 23, 1972, no. 721860, fl. white).

DARJEELING. Phalut, 3600 m (Aug. 3, 1972, fl. white).

Distr. E. Himalaya (Nepal, Sikkim).

Impatiens serrata Bentham [in Wall., Cat. no. 4771 (1831), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. **4**: 136 (1860)–Hook. f., Fl. Brit. Ind. **1**: 473 (1875), p.p.; in Rec. Bot. Surv. Ind. **4**: 10 (1904); **4**: 18 & 23 (1905).

I. serrulata Hook. f., l.c. **4**: 7 & 10 (1904).

NEPAL. Tsedang Pokhari, 3000 m (Aug. 23, 1969, fl.); Singum Gompa, 3200 m (Aug. 22, 1972, no. 723205, fl.); Mangen–Khodang Danda, 3100–2500 m (Aug. 28, 1972, fl.).

Distr. Himalaya (Kumaon to Bhutan).

Impatiens sulcata Wall. in Roxb., Fl. Ind. ed. Carey, **2**: 458 (1824)–Hook. f. et Thoms. in Journ. Linn. Soc. **4**: 129 (1860)–Hook. f., Fl. Brit. Ind. **1**: 469 (1875); in Rec. Bot. Surv. Ind. **4**: 19 (1905).

I. gigantea Edgew. in Trans. Linn. Soc. **20**: 38 (1846).

NEPAL. Singum Gompa-Gosainkund, 3300 m (Aug. 23, 1972, fl.).

Distr. Himalaya (Kashmir to Bhutan).

Impatiens urticifolia Wall. in Roxb., Fl. Ind. ed. Carey, **2**: 457 (1824)–Hook. f. et Thoms. in Journ. Linn. Soc. **4**: 152 (1860), incl. α et γ–Fl. Brit. Ind. **1**: 474 (1875).

NEPAL. Oo Kharka, 3400 m (Jul. 1, 1970, fl.); Bhuje, 2700 m (Jul. 4, 1972, fl.); Tinjure, 2900 m (Jul. 6, 1972, no. 723228, fl.); Gopte, 3500 m (Aug. 25, 1972, fl.); Gopte–Thale Patil, 3500–3400 m (Aug. 26, 1972, no. 723223, fl.).

DARJEELING. Phalut, 3500 m (Aug. 3, 1972, fl. brown-purple).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

Impatiens Wallichii Hook. f. in Rec. Bot. Surv. Ind. **4**: 15 & 20 (1905).

I. discolor DC. sensu Wall., Cat. no. 4767 (1831), p.p.

Nepal. Mul Kharka, 3800 m (Jul. 1, 1970, fl.); Singum Gompa–Gosainkund, 3200–3700 m (Aug. 23. 1972, no. 723222, fl. yellowish white).

Distr. E. Himalaya (Nepal, Sikkim).

RHAMNACEAE (by Yasuiti Momiyama)

Berchemia flavescens (Wall.) Brongniart: Momiyama in Fl. E. Himal. 197 (1966); **2**: 76 (1971).

Nepal. Langtang Gorge–Syerpagaon, 2900–2600 m (Jul. 17, 1970, fl., "Fruits blue black"); Shewaden, 2600 m (Jun. 29, 1972, bud); Tinjure Phedi, 2700 m (Jul. 6 1972, fl. & fr.).

Darjeeling. Phalut–Raman, 3600–2100 m (Aug. 4, 1972, fl.).

Rhamnus virgatus Roxb.: Fl. E. Himal. 198 (1966); **2**: 77 (1971).

Nepal. Yatumbal–Tangjet, 2700–1750 m (Jul. 8, 1970, fr.).

var. **flavidus** (Momiyama) Momiyama, comb. nov.

Rhamnus flavidus Momiyama in Fl. E. Himal. **2**: 76 (1971).

Nepal. Balaju, Kathmandu, 1300 m (Jun. 16, 1967, fr. Holotype in TI).

Distr. E. Himalaya (Nepal).

Haec planta a typo pilositate tantum diversa.

Zizyphus mauritiana Lam.: Fl. E. Himal. 198 (1966); **2**: 77 (1971).

Nepal. Shyaprubensi–Tangjet, 1500–1800 m (Jun. 27, 1970, bud).

Zizyphus rugosa Lam.: Fl. E. Himal. 77 (1971).

Nepal. Dhara Pani–Tamur Bridge, 1000–300 m (Jun. 3, 1972, young fruits round, green after yellowish).

VITACEAE (by Yasuiti Momiyama)

Ampelocissus latifolia (Roxb.) Planch. in Journ. la Vigne am. Des. **1884**: 374 (1884); in DC., Monogr. Phan. **5**: 370 (1887).

Vitis latifolia Roxb. [Hort. Beng. 18 (1814), nom. nud.] Fl. Ind. ed. 2, **1**: 661 (1832)–Laws. in Fl. Brit. Ind. **1**: 652 (1875).

Nepal. Bir Gaon-Dingla, 1600-1000 m (Jul. 1. 1972, fl.).

Distr. Himalaya (Kumaon, Moradabad, and Nepal), Assam, and W. Peninsula.

Ampelocissus nervosa (Laws.) Planch. in DC., Monogr. Phan. **5**: 372 (1887).

Vitis nervosa Laws. in Fl. Brit. Ind. **1**: 650 (1875).

Nepal. Dunche, 1800 m (Jun. 26, 1970, fl.); Bir Gaon-Dingla, 1600-1000 m (Jul. 1, 1972, fr.).

Distr. Himalaya (Nepal, Sikkim).

Ampelocissus rugosa (Laws.) Planch. in DC., Monogr. Phan. **5**: 376 (1887).

Vitis lanata Roxb. var. *rugosa* Laws. in Fl. Brit. Ind. **1**: 651 (1875).

Nepal. Bir Gaon-Dingla, 1600-1000 m (Jul. 1, 1972, fl.); Gram-Dunche, 1900 m (Aug. 21, 1972, fl.).

Distr. Himalaya (Garhwar, Nepal), Assam, and Tenasserim.

Ampelocissus sikkimensis (Laws.) Planch.: Momiyama in Fl. E. Himal. 198 (1966).

Nepal. Gram-Dunche, 1900-2000 m (Aug. 21, 1972, fl.).

Distr. E. Himalaya (E. Nepal, Sikkim) and Assam.

Cissus javana DC.: Fl. E. Himal. 199 (1966); **2**: 78 (1971).

NEPAL. Sanguri Bhanjyang-Dharan, 1300-400 m (Jul. 10, 1972).

Leea acuminata Wall. ex C. B. Clarke: Fl. E. Himal. 199 (1966); **2**: 78 (1971).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972, fl.).

Distr. E. Himalaya (Nepal to N. Assam), Garrow Hills, Manipur, Thailand, and Indo-China.

Leea aspera Wall. [in Roxb., Fl. Ind. ed. Carey, **2**: 468 (1824), nom. nud., ad nota] ex Edgew. in Trans. Linn. Soc. **20**: 36 (1846)–C. B. Clarke in Journ. Bot. **19**: 136 (1881).

L. herbacea Hamilt. ex C. B. Clarke sensu Momiyama in Fl. E. Himal. **2**: 78 (1971), p.p.

L. robusta Roxb. sensu Momiyama in Fl. E. Himal. **2**: 79 (1971).

NEPAL. Pokhara, 900 m (Jun. 18, 1967, fl., ut *L. robusta*); Godawari (May 28, 1969, ut *L. robusta*); Shyaprubensi, 1500 m (Jun. 27, 1970); Okhre Danra–Deorali, 2000–1900 m (Sep. 2, 1970, "Fruits depressed globose, grayish blue.").

DARJEELING. Ghum, 2150–2300 m (Jun. 8, 1967, fl., ut *L. robusta*).

SIKKIM. Gangtok–Temi, 800–1620 m (Jun. 28, 1969, fl., ut *L. herbacea*).

Distr. Himalaya (Kashmir, Kumaon to Nepal), Assam, and W. Peninsula.

Leea bracteata C. B. Clarke in Journ. Bot. **19**: 164 (1881).

L. robusta Roxb. sensu Laws. in Fl. Brit. Ind. **1**: 667 (1875), p.p.

NEPAL. Jaspar–Jureli, 300–340 m (Apr. 20, 1969).

Distr. E. Himalaya (Nepal, Sikkim), Oudh Terai, Assam, and Indo-China.

Leea herbacea Hamilt. ex C. B. Clarke: Fl. E. Himal. 200 (1966); **2**: 78 (1971), p.p.

DARJEELING. Darjeeling–Tista, 2300–400 m (Aug. 10, 1972, fr.).

Distr. E. Himalaya (Nepal to Bhutan), Khasia, Burma, and Thailand.

Tetrastigma lanceolarium (Roxb.) Planch. in DC., Monogr. Phan. **5**: 423 (1887)–Suessenguth in Engl. et Prantl, Pfl.-fam. 2 Aufl. **20**d: 322, fig. 95 (1953).

Cissus lanceolaria Roxb., Fl. Ind. ed. Carey, **1**: 430 (1820).

Vitis lanceolaria Wall., Cat. no. 6013, a–d, h (1831–32)–Laws. in Fl. Brit. Ind. **1**: 660 (1875).

T. dubium (Laws.) Planch. sensu Momiyama in Fl. E. Himal. 200 (1966).

NEPAL. Dharan–Dhara Pani, 400–1300 m (Jun. 2, 1972, fr.).

DARJEELING. Takdah, 1700 m (Apr. 19, 1960, fr., ut *T. dubium*); Takdah–Rayang, 2500 m (Apr. 20, 1960, fr., ut *T. dubium*); Rayang (Apr. 21, 1960, fr., ut *T. dubium*).

Distr. India, E. Himalaya (Nepal, Sikkim), Assam, and Burma.

Tetrastigma obtectum (Wall.) Planch. in DC., Monogr. Phan. **5**: 434 (1887).

Vitis obtecta Wall., Cat. no. 6026 (1831–32)–Laws. in Fl. Brit. Ind. **1**: 657 (1875).

Tetrastigma burmanicum Momiyama in Fl. E. Himal. **2**: 79 (1971), excl. basionym.

NEPAL. Godawari–Phulchoki, 1600–2500 m (Jun. 26, 1967, fr., ut *T. burmanicum*); Deorali-Chitlang, 1900–1500 m (Sep. 3, 1970, "Fruits 1-seeded, green, then grayish purple and then black, globose, sarcocarps blood red. Seeds flat, orbicular, soft, pale green.").

BHUTAN. Ratsoo, 2000 m (Apr. 24, 1967, fl., ut *T. burmanicum*).

Distr. Himalaya (Kumaon to Nepal) and W. China (Yunnan, Kweichou, Szechuan).

Tetrastigma serrulatum (Roxb.) Planch.: Fl. E. Himal. 201 (1966); **2**: 80 (1971).

NEPAL. Nagarjun, Kathmandu, 1500 m (Apr. 24, & 29, 1970, ster.); Dor, 2600 m (Jun. 6, 1972, fl.); Chitre–Teku Nala, 2400–800 m (Jul. 8, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972, fl.); Bhorlang–Sundarijar, 2400–1400 m (Aug. 31, 1972).

DARJEELING. Raman–Rimbick, 2400–2200 m (Aug. 5, 1972, fr.).

Vitis parvifolia Roxb.: Fl. E. Himal. 201 (1966); **2**: 80 (1971).

NEPAL. Phulchoki, 1500–2700 m (Apr. 11, 1969, fl.).

TAMARICACEAE (by Hiroshi Hara)

Myricaria rosea W. W. Smith in Not. Bot. Gard. Edinb. **10**: 52 (1917)–Hand.-Mzt., Symb. Sin. **7**: 373 (1931)–Hara in Trans. Bot. Soc. Edinb. **41**: 344 (1972).

M. prostrata Hook. f. et Thoms. ex Benth. et Hook. f., Gen. Pl. **1**: 161 (1862), p.p.

M. germanica Desv. var. *prostrata* (Benth. et Hook. f.) Dyer in Fl. Brit. Ind. **1**: 250 (1874), p.p.–Hara, Fl. E. Himal. 211 (1966).

NEPAL. Topke Gola, 3800 m (Jun. 18, 1972, fl.); Lama Chungbu–Thudam, 4000 m (Jun. 24, 1972, no. 723060, fl.).

BHUTAN. Chamsa–Yabu Thang, 3400 m (May 15, 1967, fl.); Laya–Laum Thang, 4050 m (May 18, 1967, fl.); Chawa Gassar–Seanchu Passa, 3900–4700 m (May 20, 1967, fl.); Shodu–Barshong, 3900 m (May, 24 1967, fl.).

Distr. Himalaya (Kumaon to Bhutan), S. Tibet, and W. China.

VIOLACEAE (by Hiroshi Hara)

Viola betonicifolia J. E. Smith in Rees, Cyclop. **37**: *Viola* no. 7 (1817)–Jacobs et D. M. Moore in Fl. Males. **7**: 202 (1971).

V. Patrinii var. *napaulensis* Gingins ex DC., Prodr. **1**: 293 (1824).

V. caespitosa D. Don, Prodr. Fl. Nepal. 205 (1825).

V. Patrinii DC. sensu Hook. f. et Thoms. in Fl. Brit. Ind. **1**: 183 (1872).

V. betonicifolia subsp. *nepalensis* (Ging.) W. Becker in Engl., Bot. Jahrb. Beibl. **120**: 166 (1917).

BHUTAN. Thimphu, 2450 m (Apr. 6, 1967, fl.); Dochu La–Wangdu Phodrang, 1800 m (Apr. 9, 1967, fl.); Tashiling–Tongsa, 2300–1900 m (Apr. 16, 1967, fl.); Ratsoo–Samtengang, 2100–2800 m (Apr. 25, 1967, fl.); Bhotokha–Rinchu, 1450–1500 m (May 8, 1967); Khosa–Tamji, 1800–2200 m (May 11, 1967, fl.).

f. **pubescens** Hara, f. nov.

Petioli pedunculique dense minute pubescentes, pilis brevibus reclinatis vel subpatentibus. Etiam paginae foliorum saepe minute pubescentes.

BHUTAN. Nyatoka–Samtengang, 1500–2100 m (Apr. 10, 1967, fl.); Ratsoo–Samtengang, 2000–2800 m (Apr. 25, 1967, fl.); Samtengang–Choojom, 1500–2100 m (Apr. 26, 1967); Thimphu, 2450 m (Kanai et al. Apr. 30, 1967, no. 15658, fl. Holotype in TI); Tzatogang–Dotanang, 3200–2700 m (May 27, 1967, fl.).

Distr. sp. Himalaya, India, east to S. Japan, south to Malaysia, and Australia.

The specimens from Bhutan cited above are very variable. As compared with typical *V. betonicifolia,* the stipules are often pale-coloured, the petioles are sometimes much shorter, the base of leaves is rarely sagittate as in subsp. *novoguineensis* Moore, the flowers are pale pink to violet, and the plants are occasionally very dwarf. A form with minutely pubescent leaves, petioles and penduncles is named here as f. *pubescens.* Another form with broader cordate leaves also occurs in Bhutan, and further studies are much needed.

Viola bhutanica Hara in Journ. Jap. Bot. **48**: 356, f. 2 (1973).

BHUTAN. Thimphu, 2450 m (Apr. 29, 1967, no. 15620. Holotype in TI; Apr. 6, 7 & 30, 1967, fl.); Dotanang–Thimphu, 2500–2600 m (May 28, 1967, fl.).

Distr. Endemic to Bhutan.

Among the acaulescent species from Himalaya, this species is characterized in having broad ovate leaves which are deeply cordate at the base and are distinctly pilose above with long white spreading hairs.

Viola bulbosa Maxim. in Bull. Acad. Sci. St.-Pétersb. **23**: 334 (1877)–O. Stapf in Kew Bull. **1894**: 370 (1894).

V. tuberifera Franch.: Hara, Fl. E. Himal. **2**: 82 (1971).

Distr. Himalaya (Nepal to Bhutan), S. Tibet, and W. China.

Viola canescens Wallich in Roxb., Fl. Ind. ed. Carey, **2**: 450 (1824)–Watt in Journ. Linn. Soc. **18**: 379, t. 11B (1881)–W. Becker in Beih. Bot. Centralbl. **40** (2): 110 (1920).

V. serpens Wall. var. *canescens* (Wall.) Hook. f. et Thoms. in Fl. Brit. Ind. **1**: 184 (1872), p.p.

BHUTAN. Dochu La–Wangdu Phodrang, 1800–1450 m (Apr. 9, 1967, fl. white or pink-violet with violet veins); Kybaka–Samtengang, 1600 m (Apr. 10, 1967, fl. pale violet); Tinlegang–Gon Chungnang, 1950–1800 m (May 5, 1967, fl.); Punakha–Bhotokha, 1400–1450 m (May 7, 1967, fl.).

Distr. Himalaya (Kashimir to Bhutan).

Viola paravaginata Hara: Fl. E. Himal. **2**: 82 (1972).

NEPAL. Minchin Dhap–Mul Pokhari, 2900–2500 m (Oct. 29, 1963); Godawari–Phulchoki, 2500–2800 m (May 29, 1969); Tinjure Phedi, 2700 m (Jul. 6, 1972, fr.).

BHUTAN. Tashiling–Tongsa, 2300–2000 m (Apr. 14, 1967, fl.); Tongsa–Tratang, 2200–2700 m (Apr. 17, 1967, fl.); Chendebi–Rukubi, 2500 m (Apr. 21, 1967, fl. pale violet); Longtepang–Ritang, 3000–2600 m (Apr. 22, 1967, fl.); Gasa–Pari La, 2800 m (May 14, 1967, fl.); Tzatogang–Dotanang, 3200–2700 m (May 27, 1967, fl. white with violet veins).

Distr. E. Himalaya (Nepal to Bhutan).

This species seems to be closely related to *V. moupinensis* Franchet of West China. The latter, however, has barbate lateral petals and sometimes ascending stem-like stolons which are foliate in the upper part.

Viola pilosa Blume, Cat. Gew. Buitenz. 57 (1823); Bijdr. 57 (1825)–Jacobs et D. M. Moore in Fl. Males. **7**: 207, f. 16 & 17 (1971), excl. *V. glaucescens* Oudem.

V. serpens Wall. ex Gingins in DC., Prodr. **1**: 296 (1824): Fl. E. Himal. 213 (1966).

V. aspera Gingins in DC., l.c. 295 (1824).

V. palmaris Hamilt. ex DC., l.c. 298 (1824).

V. serpens var. *glabra* Hook. f. et Thoms. in Fl. Brit. Ind. **1**: 184 (1872), excl. syn.

NEPAL. Phulchoki, 2000–3000 m (Jun. 26, 1967; Jun. 10, 1969 & May 28, 1972, fl. & fr.); Dunche, 2100 m (Jun. 3, 1969); Dunche–Gosainkund, 2000–3000 m (Jun. 4, 1969, fl.); Sheopuri, 2700 m (Jun. 14, 1969, fl.); Chitre, 2400 m (Jun. 5, 1972, fl.); Tute-Dor, 2500–2600 m (Jun. 6, 1972); Suke–Hile Chok, 2900–3500 m (Jun. 11, 1972, fl.).

DARJEELING. Tonglu, 3100 m (Apr. 30, 1970, fl.); Phalut–Raman, 3600–2100 m (Aug. 4, 1972, fr.).

BHUTAN. Chimakhoti, 2350 m (Apr. 4, 1967, fl.); Tsarza La–Ritang, 2800–2000 m (Apr. 11, 1967, fl.); Chendebi–Neylong, 2400 m (Apr. 14, 1967); Tashiling–Tongsa, 2300–1900 m (Apr. 16, 1967); Ritang–Ratsoo, 2600–2000 m (Apr. 23, 1967); Ratsoo, 2000 m (Apr. 24, 1967); Gon Chungnang, 1800 m (May 5, 1967), Mishichen–Khosa, 1600–1800 m (May 10, 1967); Tamji–Gasa, 2200 m (May 13, 1967, fl.); Gasa–Chamsa, 2800–3700 m (May 14, 1967, fl.); Tzatogang–Dotanang, 2800 m (May 27, 1967, fl.).

Distr. Afghanistan, Himalaya, Assam, Burma, Indo-China, China, and Malaysia.

This species is very variable especially in hairiness. The Himalayan plants are often less hairy, and *V. palmaris* was named to a glabrescent form.

Viola pilosa, *V. canescens*, *V. Thomsonii* Oudem. and *V. glaucescens* Oudem. are closely related, but are distinguished as follows:

1 Style subtruncate at the apex (not marginate nor rostellate). Petioles hairy, at least retrorse-pilose in the upper part. Capsules subglobose, seeds generally punctate-scabrous 2
Style marginate and shortly rostellate at the apex. Petioles & peduncles glabrous. Capsules elongate oblong, seeds smooth 3

2 Leaves cordate-ovate–lanceolate-ovate, acuminate or long-acuminate, thin, white-pilose above or gabrescence. Stipules broad-lanceolate shorter-fimbriate. All upper petals often barbate. Capsules hairy or glabrous . . *V. pilosa*
Leaves ovate–reniform-cordate, obtuse–roundish at the apex, thickish, canescent-pilose. Petioles densely retrorse-pubescent. Stipules lanceolate longer-fimbriate, often brown. Capsules hairy . . . . *V. canescens*

3 Leaves oblong-ovate–cordate-ovate, acutish, slightly white-pilose. Stipules lanceolate long-setaceo-fimbriate, often dark brown. Peduncles with longer bracteoles often in the upper part. Sepal-appendages often unequal, some elongate . . . . *V. Thomsonii*
Leaves cordate or roundish cordate, shortly acuminate or obtuse, glabrous or sparsely short-pilose. Stipules often broad-lanceolate. Peduncles with narrow bracteoles about at the middle. Sepal-appendages short . . *V. glaucescens*

Viola Wallichiana Ging. ex DC., Prodr. **1**: 300 (1824)–Becker in Beih. Bot. Centralbl. **34** (2): 262 (1916)–Kanai in Journ. Jap. Bot. **46**: 317 (1971).

V. reniformis Wall. in Roxb., Fl. Ind. ed. Carey **2**: 451 (1824).

V. biflora L. sensu Hook. f. et Thoms. in Fl. Brit. Ind. **1**: 182 (1872), p.p.

NEPAL. Sheopuri, Kathmandu, 2700 m (Jun. 14, 1969, no. 673286, fl.); Thale-Dunche, 2000 m (Jun. 25, 1970, fl.); Langtang Gorge, 2640 m (Jul. 17, 1970, fl.); Dor, 2600 m (Jun. 6, 1972, fl.); Dor–Tinjure, 2800 m (Jun. 7, 1972, fl.); Lamo Pokhari, 2900 m (Jun. 8, 1972, fl.); Topke Gola–Shewaden, 3000 m (Jun. 28, 1972, fl.); Bhuje-

Gupha Pokhari, 2900 m (Jul. 4, 1972, no. 721081, fl.); Tinjure, 2900 m (Jul. 6, 1972, fl.); Gram–Thale, 2000 m (Aug. 21, 1972, fl. & fr.); Mangen–Khodang Danda, 2800 m (Aug. 28, 1972, fl.).

Darjeeling. Tonglu–Sandakphu, 2800–3900 m (Jul. 13, 1969, fl.); Phalut–Mt. Singalila, 3900 m (Jul. 17, 1969, fl.).

Distr. Himalaya (Nepal to Bhutan).

PASSIFLORACEAE (by Hiroshi Hara)

Passiflora napalensis Wall., Tent. Fl. Napal. 20, t. 11 (1824)–Masters in Fl. Brit. Ind. **2**: 600 (1879). [Plate 5e]

P. geminiflora D. Don, Prodr. Fl. Nepal. 63 (1825)–de Wilde in Blumea **20**: 243 (1972).

Anthactinia nepalensis (Wall.) M. Roem., Syn. Monogr. Pepon. **1**: 190 (1846).

Nepal. Mul Pokhari–Dumhan, 2000–700 m (Oct. 30, 1963, fr.); Dumhan–Taplejung, 700–2000 m (Nov. 1, 1963, fr.); Taplejung, 2000 m (Nov. 2, 1963, no. 6306613, fr.); Dhara Pani–Sanguri Bhanjyang, 1200 m (Jul. 10, 1972, no. 721235, fl.).

Distr. Himalaya (Nepal to Bhutan), Assam, and Burma.

BEGONIACEAE (by Hiroshi Hara)

Begonia dioica Hamilt. ex D. Don, Prodr. Fl. Nepal. 223 (1825). [Plate 5d]

B. tenella D. Don, l.c. 223 (1825).

B. amoena Wall. [Cat. no. 3682 (1831), nom. nud.] ex A. DC., Prodr. **15** (1): 327 (1864)–C. B. Clarke in Fl. Brit. Ind. **2**: 642 (1879).

Nepal. Sim Chotala–Gram, 1500–1900 m (Aug. 20, 1972, no. 723653, fl.).

Darjeeling. Siri Khola–Rimbick, 2000–2200 m (Aug. 5, 1972, ♀-fl.); Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972,♂-fl.); Palmajua, 2200 m (Aug. 7, 1972, ♀-fl.).

Distr. Himalaya (Punjab to Sikkim).

Begonia flagellaris Hara in Journ. Jap. Bot. **48**: 358, f. 3 (1973).

Nepal. Pulchoki, Kathmandu, 2200–2700 m (Aug. 9, 1969, fl.); Chipling–Ingyur, 2160–2440 m (Aug. 21, 1969, fl.); Gul Bhanjyang–Latsu, 2300–2400 m (Aug. 29, 1972, no. 723648, fl. Holotype in TI).

Distr. Endemic to Nepal.

The plants have long creeping leafy stolons, and bear ascending inflorescences at their lower nodes.

Begonia Hatacoa Hamilt. ex D. Don, Prodr. Fl. Nepal. 223 (1825)–Hara in Journ. Jap. Bot. **47**: 143 (1972).

B. rubro-venia Hook. f.: Hara, Fl. E. Himal. 215 (1966); **2**: 85 (1971).

Nepal. Dhara Pani–Sanguri Bhanjyang, 1200 m (Jul. 10, 1972, no. 721233, fl.).

Begonia leptoptera Hara in Journ. Jap. Bot. **48**: 98, pl. 1 (1973).

B. adscendens C. B. Clarke sensu Hara, Fl. E. Himal. **2**: 83 (1971).

Nepal. Kiwa–Taplethok, 1500 m (Nov. 5, 1963, fr.); Taplethok–Helok, 1400–1500 m (Nov. 6, 1963, no. 6304546, fr.); Thale–Thale Bisauna, 2500 m (Sep. 10, 1970, no. 4032, fl. Holotype in TI).

Distr. Endemic to Nepal.

The species differs from *Begonia Josephii* A. DC. in having non-peltate maculate leaves, simple umbellate inflorescences, and lanceolate narrow wing of capsules.

Begonia ovatifolia A. DC. in Ann. Sci. Nat. ser. 4, **11**: 132 (1859); Prodr. **15** (1): 328 (1864)–Fl. Brit. Ind. **2**: 642 (1879).

DARJEELING. Tista, 400 m (Aug. 10, 1972, fl.).

Distr. E. Himalaya (Nepal, Sikkim) and Khasia.

ELAEAGNACEAE (by Yasuichi Momiyama)

Elaeagnus caudata Schlecht. ex Momiyama in Fl. E. Himal. **2**: 85, fig. 7 (1971)–Momiyama et Hara in Journ. Jap. Bot. **48**: 264 (1973).

Elaeagnus infundibularis Momiyama apud Momiyama et Hara in Journ. Jap. Bot. **48**: 262, fig. 3 (1973).

E. arborea Roxb. sensu D. Don, Prodr. Fl. Nepal. 67 (1825)–Momiyama in Fl. E. Himal. 216 (1966); **2**: 85 (1971).

NEPAL. Kakani, Kathmandu (Dec. 16, 1969, no. 674486, fl. Holotype in TI).

Distr. E. Himalaya (Nepal to Bhutan).

Elaeagnus Kanaii Momiyama apud Momiyama et Hara in Journ. Jap. Bot. **48**: 264, fig. 4 (1973).

NEPAL. Chilime–Khirojet, 1800 m (Jun. 28, 1970, no. 68, fr. Holotype in TI).

Distr. Nepal.

MELASTOMATACEAE (by Hiroshi Hara)

Sonerila khasiana C. B. Clarke in Fl. Brit. Ind. **2**: 539 (1879)–C.E.C. Fischer in Kew Bull. **1932**: 199 (1932.)

NEPAL. Latsu–Pati Bhanjyang, 1900 m (Aug. 30, 1972, no. 723110, fl. rose-purple).

Distr. E. Himalaya (Nepal), Assam, S. Tibet, and N. Burma.

ARALIACEAE (by Hiroo Kanai)

Acanthopanax cissifolius (Griff.) Harms.: Hara in Fl. E. Himal. **2**: 90 (1971).

NEPAL. Phulchoki, 2500 m (May 28, 1972); Topke Gola, 3600 m (Jun. 28, 1972).

BHUTAN. Thimphu, 2300 m (Apr. 30, 1967).

Aralia cachemirica Decne.: Mizushima in Fl. E. Himal. 225 (1966).

NEPAL. Langtang Gorge–Syerpagaon, 2400 m (Jul. 17, 1970).

Brassaiopsis mitis C. B. Clarke: Fl. E. Himal 226 (1966).

NEPAL. Mewa Khola, 2100 m (Jun. 29, 1972).

DARJEELING. 2200 m (Jul. 25, 1969).

BHUTAN. Khosa–Tamji, 2000 m (May 11, 1967).

Hedera nepalensis K. Koch: Fl. E. Himal. 226 (1966).

NEPAL. Sheopuri, 2500 m (Sep. 22, 1970); Phulchoki, 2600 m (Oct. 21, 1970).

DARJEELING. 2100 m (Jul. 23, 1972).

BHUTAN. Putli Bhir–Pasikha, 2000 m (Apr. 4, 1967); Thimphu, 2500 m (Apr. 7, 1967); Samtengang–Sena Thang, 2500 m (Apr. 11, 1967); Tsarza La–Ratsoo, 2200 m (Apr. 11, 1967); Tongsa–Tratang, 2400 m (Apr. 17, 1967); Ritang–Ratsoo, 2000 m (Apr. 23, 1967); Rinchu–Mishichen, 1500 m (May 9, 1967); Khosa–Tanji, 1900 m (May 11, 1967).

Macropanax dispermus (Bl.) O. Kuntze: Fl. E. Himal. 227 (1966).

NEPAL. Phulchoki, 2000 m (Nov. 3, 1970).

DARJEELING. Batasi, 1900 m (Aug. 9, 1972).

Pentapanax Leschenaultii (Wight et Arnott) Seemann: Fl. E. Himal. 227 (1966).

NEPAL. Thale–Dunche, 1900-2000 m (Jun. 3, 1969 & Jun. 25, 1970); Bagdwar, Sheopuri, 2500 m (Jun. 15, 1969); Mane Gaon–Thale, 1800 m (Jun. 24, 1970); Phulchoki, 2500 m (May 28, 1972); Tope Gola-Shewaden, 3000 m (Jun. 28, 1972).

DARJEELING. Mekma–Tonglu, 2800 m (Jul. 30, 1972).

BHUTAN. Tzatogang–Dotanang, 2700 m (May 27, 1967); Thimphu–Dochu La, 2800 m (May 30, 1967).

Schefflera impressa (C. B. Clarke) Harms: Fl. E. Himal. 228 (1966).

NEPAL. Phulchoki, 2500 m (Jul. 15, 1972).

UMBELLIFERAE (by Hiroo Kanai)

Acronema Hookeri (C. B. Clarke) Wolff. in Engl., Pfl.-reich, IV-228, Ht. **90**: 323 (1927).

Pimpinella Hookeri C. B. Clarke in Fl. Brit. Ind. **2**: 686 (1879).

NEPAL. Kutumsang–Tsedang Pokhari, 2500 m (Aug. 22, 1969. On tree. Petals purple with elongate tip).

Distr. E. Himalaya (Nepal and Sikkim).

Cortia depressa (D. Don) C. Norman in Journ. Bot. **75**: 94 (1937).

Athamanta depressa D. Don, Prodr. Fl. Nepal. 184 (1825).

C. Lindleii DC., Prodr. **4**: 187 (1830)–C. B. Clarke in Fl. Brit. Ind. **2**: 701 (1879).

NEPAL. Gadje–Surjakund, 4000 m (Aug. 26, 1969); Topke Gola, 3800 m (Jun. 18, 1972); Thudam–Lama Chungbu, 3900 m (Jun. 23, 1972); Gosainkund, 4300 m (Aug. 27, 1972).

Distr. Himalaya (Kumaon to Bhutan).

Cortia Hookeri C. B. Clarke in Fl. Brit. Ind. **2**: 702 (1879).

NEPAL. Gosainkund, 4300 m (Aug. 27, 1969).

Distr. E. Himalaya (Nepal and Sikkim).

Pimpinella achilleifolia (DC.) C. B. Clarke in Fl. Brit. Ind. **2**: 684 (1879).

Ptychotis achilleifolia DC., Prodr. **4**: 109 (1830).

NEPAL. Tanguni–Chipling, 2100 m (Aug. 21, 1969).

Distr. Himalaya (Kumaon to Sikkim).

Pleurospermum apiolens C. B. Clarke in Fl. Brit. Ind. **2**: 705 (1879).

NEPAL. Gadje, 3900 m (Aug. 26, 1969. Bracteoles whitish. Petals yellowish green. Discs green).

Distr. E. Himalaya (Nepal and Sikkim).

Pleurospermum Benthami (DC.) C. B. Clarke in Fl. Brit. Ind. **2**: 703 (1879).

Hymenolaena Benthamii DC., Prodr. **4**: 246 (1830).

NEPAL. Phulchoki, 2600 m (Aug. 9, 1969).

Distr. Nepal.

Pleurospermum dentatum (DC.) Benth. in Benth. et Hook. f., Gen. Pl. **1**: 915 (1867)–C. B. Clarke in Fl. Brit. Ind. **2**: 704 (1879).

Hymenolaena dentata DC., Prodr. **4**: 245 (1830).

NEPAL. Gotiora–Gadje, 3600 m (Aug. 25, 1969, petals yellowish dark green with white margin).

Distr. Himalaya (Kumaon to Sikkim).

Pleurospermum rotundatum (DC.) Benth. in Benth. et Hook. f., Gen. Pl. **1**: 915 (1867)–C. B. Clarke in Fl. Brit. Ind. **2**: 703 (1879).

Hymenolaena rotundata DC., Prodr. **4**: 245 (1830).

NEPAL. Hile Dhap–Mane, 3400 m (Aug. 24, 1969, petals patent, not incurved, purple with a white stripe on each).

Selinum tenuifolium Wall. [Cat. no. 579 (1829), nom. nud., p.p.] ex C. B. Clarke in Fl. Brit. Ind. **2**: 700 (1879).

NEPAL. Rock Shelter I, 3270 m (Aug. 24, 1969).

Distr. Himalaya (Kashmir to Bhutan).

Trachydium obtusiusculum (DC.) C. B. Clarke in Fl. Brit. Ind. **2**: 673 (1879).

Hymenolaena obtusiuscula DC., Prodr. **4**: 246 (1830).

NEPAL. Tsedang Pokhari–Panghu Danda, 3100 m (Aug. 23, 1969).

Distr. Himalaya (Nepal and Sikkim).

CORNACEAE (by Hiroshi Hara)

Helwingia himalaica Hook. f. et Thoms. ex C. B. Clarke: Hara, Fl. E. Himal. 232 (1966); **2**: 92 (1971). [Plate 5a, b]

Confer a critical study of the genus on pages 393–413.

DICOTYLEDONEAE—SYMPETALAE

PRIMULACEAE (by Hiroshi Hara)

Primula Buryana Balfour f. in Kew Bull. **1922**: 151 (1922)–W. W. Smith et Fletcher in Journ. Linn. Soc. **52**: 323 (1942).

NEPAL. Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972, fl. white); Topke Gola, 3600 m (Jun. 17, 1972, fl.); Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972, fl.); Thudam–Kipuphu, 3400–4500 m (Jun. 26, 1972, fl.); Kipuphu–Topke Gola, (Jun. 27, 1972, fl.).

Distr. Himalaya (E. Nepal).

Primula Dickieana G. Watt in Journ. Linn. Soc. **20**: 9, t. 8A (1882)–Hook. f., Fl. Brit. Ind. **3**: 491 (1882)–W. W. Smith et Fletcher in Trans. Bot. Soc. Edinb. **33**: 216 (1942).

P. Pantlingii King in Journ. Asiat. Soc. Beng. **55**: 228, t. 9 (1886).

NEPAL. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972, fl. yellow); Ghopte–Gosa, 3500–4100 m (Jun. 13, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan), S. Tibet, N. Burma, and W. China.

Primula megalocarpa Hara in Journ. Jap. Bot. **49**: 133 (1974).

P. Stuartii Wall. var. 4. *macrocarpa* G. Watt in Journ. Linn. Soc. **20**: 12 (Dec. 18, 1882).

P. Stuartii var. 4. *macrocarpa* Hook. f., Fl. Brit. Ind. **3**: 491 (Dec. 1882).

P. nivalis Pall. var. *macrocarpa* (Hook. f., G. Watt) Pax in Engl., Bot. Jahrb. **10**: 208 (1888), in nota; in Engl., Pfl.-reich IV-237, Ht. **22**: 104 (1905).

P. macrophylla D. Don var. *macrocarpa* (Hook. f., G. Watt) W. W. Smith et Fletcher in Trans. Roy. Soc. Edinb. **60**: 590 (1942).

NEPAL. Saju Pokhari–Topke Gola, 4200 m (Jun. 16, 1972, fl. white. Holotype in TI); Topke Gola, 3800 m (Jun. 19, 1972, fr.); Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972, fl. pink).

BHUTAN. Upper Chomolhari Chakan, 4350 m (Nishioka, Sep. 6, 1966).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

This species is clearly separated from *P. macrophylla* D. Don by paler-coloured (white, pink or mauve) flowers with broad obcordate bilobed corolla-lobes, calyces cleft nearly to the base into obtuse lobes, fewer-flowered umbell, and thick larger capsules 18–30 mm long and 8–10 mm across. Typical *P. macrophylla* has generally deep violet-purple flowers, oblong or elliptic corolla-lobes roundish at the apex, more acutish calyx-lobes, and smaller capsules generally 9–15 mm long and 5–6 mm across.

Primula prenantha Balfour f. et W. W. Smith in Not. Bot. Gard. Edinb. **9**: 191 (1916)–W. W. Smith et Fletcher in Trans. Bot. Soc. Edinb. **33**: 166 (1941).

NEPAL. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972, fl. yellow).

Distr. E. Himalaya (Nepal to Bhutan), N. Assam, S. Tibet, and N. Burma.

Primula soldanelloides G. Watt in Journ. Linn. Soc. **20**: 10, t. 11C (1882)–

Fl. Brit. Ind. **3**: 493 (1882)–Pax in Engl., Pfl.-reich IV-237, Ht. **22**: 69, f. 24C (1905)–W. W. Smith et Fletcher in Journ. Linn. Soc. **52**: 331 (1942).

NEPAL. Phujeng La, 4500 m (Jun. 27, 1972, fl. white).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

Primula spathulifolia (Hook. f.) Craib in Journ. Roy. Hort. Soc. **39**: 190 (1913)–W. W. Smith et Fletcher in Trans. Bot. Soc. Edinb. **33**: 245 (1942).

P. minutissima Jacq. ex DC. var. *spathulata* Hook. f., Fl. Brit. Ind. **3**: 494 (1882).

NEPAL. Gosa–Banduke Pokhari, 4100–4200 m (Jun. 14, 1972, fl. rose).

Distr. E. Himalaya (Nepal, Sikkim).

Primula strumosa Balfour f. et Cooper in Not. Bot. Gard. Edinb. **9**: 201 (1916)–W. W. Smith et Fletcher in Trans. Roy. Soc. Edinb. **61**: 305 (1944).

NEPAL. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972, fl. orange-yellow); Ghopte–Gosa, 3500–4100 m (Jun. 13, 1972, fl.); Gosa, 4100 m (Jun. 14, 1972, fl.); Banduke Pokhari, 4200–4000 m (Jun. 15, 1972, fl.); Thudam–Kipudonsu, 3800 m (Jun. 26, 1972, fl.).

Distr. E. Himalaya (Nepal, Bhutan) and S. Tibet.

Primula Stuartii Wall. in Roxb., Fl. Ind. ed. Carey, **2**: 20 (1824); Tent. Fl. Napal. 44, t. 34 (1824)–Balfour in Bot. Mag. t. 4356 (1848)–W. W. Smith et Fletcher in Trans. Roy. Soc. Edinb. **60**: 607 (1942).

NEPAL. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972, fl. cream yellow); Banduke Pokhari–Saju Pokhari, 4200–4000 m (Jun. 15, 1972, fl. yellow).

Distr. Himalaya (Punjab to Nepal).

Primula tenuiloba (Hook. f.) Pax in Engl., Bot. Jahrb. **10**: 204 (1888)–W. W. Smith et Fletcher in Trans. Bot. Soc. Edinb. **33**: 250 (1942).

P. muscoides Hook. f. var. *tenuiloba* Hook. f. in Journ. Linn. Soc. **20**: 15, t. 13A (1882); Fl. Brit. Ind. **3**: 495 (1882).

NEPAL. Jalang Chhyongo–Thudam, 3400–4600 m (Jun. 21, 1972, fl. pale pink or white); Thudam–Kipuphu, 3400–4500 m (Jun. 26, 1972, fl.); Kipuphu–Topke Gola, 4500–3600 m (Jun. 27, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

GENTIANACEAE (by Hiroshi Hara)

Cotylanthera paucisquama C. B. Clarke in Fl. Brit. Ind. **4**: 94 (1883). [Plate 6d]

C. yunnanensis W. W. Smith in Not. Bot. Gard. Edinb. **13**: 158 (1911).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972, fl. pale mauve).

Distr. E. Himalaya (Sikkim) and W. China (Yunnan).

Swertia Kingii Hook. f., Icon. Pl. **20**: 34, t. 1442 (1883)–C. B. Clarke in Fl. Brit. Ind. **4**: 734 (1885).

NEPAL. Mangen, 3100 m (Aug. 23, 1969, fl.; Aug. 28, 1972, no. 722014, fl. greenish blue).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

Swertia multicaulis D. Don, Prodr. Fl. Nepal. 127 (1825)–C. B. Clarke in Fl. Brit. Ind. **4**: 129 (1883).

NEPAL. Surjakund, Gosainkund, 4450 m (Aug. 26, 1969, fr.); Kipuphu, 4500 m (Jun. 26, 1972, no. 720785, fl. deep blue-purple); Kipuphu–Topke Gola, 4800–3600 m (Jun. 27, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan) and S. Tibet.

ASCLEPIADACEAE (by Hiroshi Hara)

Ceropegia Hookeri C. B. Clarke in Fl. Brit. Ind. **4**: 73 (1883)–Huber in Mem. Soc. Broter. **12**: 47, t. 1, fig. 11 (1957), var. *Hookeri*.

NEPAL. Tinjure, 2900 m (Jun. 7 & Jul. 6, 1972, fl.).

Distr. E. Himalaya (Nepal, Sikkim) and S. Tibet.

Gongronema napalense (Wall.) Decaisne in DC., Prodr. **8**: 624 (1844), ut *nepalense*–C. B. Clarke in Fl. Brit. Ind. **4**: 33 (1883).

Gymnema napalense Wall., Tent. Fl. Napal. 49, t. 38 (1826).

NEPAL. Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972, no. 723162, fl.).

Distr. Himalaya (Kumaon to Sikkim) and Assam.

Holostemma Ada-kodien J. A. Schultes, Syst. Veg. **6**: 95 (1820).

Sarcostemma annulare Roth, Nov. Sp. 178 (1821).

H. Rheedei Wall., Pl. As. Rar. **2**: 51 (1831)–Wight, Icon. **2**: t. 597 (1840–43) –Fl. Brit. Ind. **4**: 21 (1883).

Asclepias annularia Roxb. [Hort. Beng. 20 (1814), nom. nud.] Fl. Ind. ed. 2, **2**: 37 (1832).

H. Brunonianum Royle, Ill. Bot. Himal. 276, t. 66 (1836).

H. annularis (Roth) Schum. in Engl., Pfl.-fam. **4** (2): 250, f. 71J–K (1896)–Santapau et Irani in Bot. Mem. Univ. Bombay **4**: 53, f. 8 (1962).

NEPAL. Teku Nala, 800 m (Jul. 9, 1972, no. 721200, fl. white outside, purple inside).

Distr. Himalaya, India, Ceylon, and Burma.

Asclepias annularia Roxb., Hort. Beng. 20 (1814) is nomen nudum without citing Rheede.

Leptadenia reticulata (Retz.) Wight et Arnott, Contr. Bot. Ind. 47 (1834)–Wight, Icon. **2**: t. 350 (1840)–Fl. Brit. Ind. **4**: 63 (1883)–Bullock in Kew Bull. **1955**: 291 (1955).

Cynanchum reticulatum Retz., Obs. Bot. **2**: 15 (1781).

NEPAL. Tamur Bridge, 300 m (Jul. 9, 1972, no. 721207, fl. green-yellow).

Distr. Tropical Himalaya, India, Ceylon, Burma, Mauritius, and Madagascar.

Telosma pallida (Roxb.) Craib in Kew Bull. **1911**: 418 (1911).

Asclepias pallida Roxb. [Hort. Beng. 20 (1814), nom. nud.] Fl. Ind. ed. 2, **2**: 48 (1832).

Pergularia pallida (Roxb.) Wight et Arnott, Contr. Bot. Ind. 42 (1834)–Wight, Icon. **2**: t. 585 (1840–43)–Fl. Brit. Ind. **4**: 38 (1883).

NEPAL. Dhara Pani–Tamur Bridge, 400 m (Jun. 3, 1972, fl. green-yellow; Jul. 9, 1972, no. 723163, fl.).

Distr. Tropical Himalaya, India, and Burma.

LABIATAE (by Gen Murata)

Ajuga bracteosa Wall. ex Benth. in Wall., Pl. As. Rar. **1**: 59 (1830)–Boiss., Fl. Orient. **4**: 799 (1879)–Hook. f., Fl. Brit. Ind. **4**: 702 (1885)–Collet, Fl. Siml. 406 (1902)–Mukerjee, Lab. Ind. 224 (1940)–Rech. f., Sym. Afghan. **1**: 13 (1954) –Murata in Kitamura, Fl. Afghan. 327 (1960)–Hedge in Not. Bot. Gard. Edinb.

27: 150 (1967).

A. remota Benth., l.c. 59 (1830).

NEPAL. Shyaprubensi, 1500 m (Jul. 10, 1970); Khanging–Langtang Gorge, 2300–2800 m (Jul. 11, 1970); Thale–Thale Bisauna, 2500–2750 m (Sep. 10, 1970); Sim Chotala-Gram, 900–1900 m (Aug. 20, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Distr. Abyssinia, Afghanistan, Himalaya, and Tibet.

Ajuga lobata D. Don: Murata in Fl. E. Himal. 271 (1966); **2**: 113 (1971).

NEPAL. Jarjare, 2080 m (May 2, 1970); Phulchoki, 2200–2700 m (May 28, 1972); Hile–Chitre, 1900–2400 m (Jun. 5, 1972); Chitre–Tute, 2300–2400 m (Jun. 6, 1972); Chauke–Mul Pokhari, 2600–2900 m (Jun. 8, 1972); Lamo Pokhari–Gupha Pokhari, 2800–2900 m (Jun. 10, 1972); Chauke–Dor, 2600–2900 m (Jul. 6, 1972).

Anisomeles indica (L.) O. Kuntze: Murata in Fl. E. Himal. 272 (1966); in S.E. Asian Studies **8**: 492 (1971)–Keng in Gard. Bull. Sing. **24**: 34 (1969).

NEPAL. Khosori Khabre, 1500 m (Sep. 12, 1970).

Distr. India, Ceylon, Himalaya (Nepal), Burma, Thailand, Indo-China, Malaya, Indonesia, Philippines, China, Formosa, and Ryukyu Isls.

Clinopodium umbrosum (H.-Bieb.) C. Koch: Fl. E. Himal. 272 (1966); **2**: 114 (1971).

NEPAL. Khanging–Langtang Gorge, 2300–2800 m (Jul. 11, 1970); Thale–Kalingchok, 2500 m (Sep. 10, 1970); Thale Bisauna–Tingoang, 2900 m (Sep. 11, 1970); Dhara Pani–Dharan, 400–1300 m (Jul. 10, 1972); Sim Chotala–Gram, 1800-1900 m (Aug. 20, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

DARJEELING. East Side, 2100 m (Jul. 23, 1972).

Distr. Caucasus, Iran, Afghanistan, Himalaya, Burma, Java, China (Yunnan, Szechuan), and Formosa.

Coleus Forskohlii (Willd.) Briq.: Fl. E. Himal. 273 (1966); **2**: 114 (1971).

NEPAL. Kuli Khani, 1450 m (Sep. 2-3, 1970).

Colquhounia coccinea Wall.: Fl. E. Himal. 273 (1966); **2**: 114 (1971).

NEPAL. Khirojet–Yatumbal, Langtang valley, 2250 m (Jun. 29, 1970); Phulchoki, south of Kathmandu (Sep. 19, 1970 & Jul. 15, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Distr. Himalaya (Kumaon to Bhutan), Assam, N. Burma, N. Thailand, and China (Yunnan).

Craniotome versicolor Reichb.: Murata in Fl. E. Himal. 273 (1966); in Act. Phytotax. Geobot. **24**: 79 (1969).

NEPAL. Makwampur Garhi–Dunge Garhi, 600–1000 m (Nov. 16, 1970).

Distr. Himalaya (Nepal, Sikkim), Burma, Indo-China, and W. China (Yunnan).

Dracocephalum speciosum Benth. in Wall., Pl. As. Rar. **2**: 65 (1831)–Hook. f. in Bot. Mag. t. 6281 (1877); Fl. Brit. Ind. **4**: 665 (1885)–Kudo, Lab. Sino-Jap. Prodr. 241 (1929)–Hand.-Mzt., Symb. Sin. **7**: 918 (1936)–Mukerjee, Lab. Ind. 137 (1940)–Murata in Act. Phytotax. Geobot. **24**: 79 (1969).

DARJEELING. Sandakphu–Phalut, 3300 m (Aug. 2, 1972); Phalut–Singalila, 3600–3700 m (Aug. 3, 1972).

Distr. Himalaya (Simla to Bhutan), Tibet, and W. China (Yunnan).

Elsholtzia eriostachya (Benth.) Benth., Lab. Gen. Sp. 163 (1833)–Fl. Brit. Ind. **4**: 645 (1885)–Mukerjee, Lab. Ind. 91 (1940)–Kitamura et Murata in Kihara, Fauna Fl. Nepal Himal. 211 (1955)–Murata in Act. Phytotax. Geobot. **24**: 80 (1969).

NEPAL. Thale Bisauna–Kalingchok, 2800 m (Sep. 11, 1970); Singum Gompa–Gosainkund, 3600 m (Aug. 23, 1972).

Distr. Himalaya (Kumaon to Sikkim).

The flower of this species is yellow.

Elsholtzia flava Benth.: Murata in Fl. E. Himal. 274 (1966); in Act. Phytotax. Geobot. **24**: 80 (1969).

NEPAL. Chitlang–Chandragiri, 2000 m (Sep. 4, 1970); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972); Phulchoki, 1500 m (Sep. 6, 1972).

Distr. Himalaya (Kumaon to Sikkim) and Assam.

Elsholtzia fruticosa (D. Don) Rehder: Murata in Fl. E. Himal. 274 (1966); in Act. Phytotax. Geobot. **24**: 80 (1969).

NEPAL. Thale–Jangdang Kharka, 2500 m (Sep. 23, 1970).

Distr. Himalaya (Kashmir to Bhutan), Assam, Tibet, and China.

Elsholtzia strobilifera Benth.: Fl. E. Himal. 274 (1966).

NEPAL. Thale Bisauna–Kalingchok, 2800 m (Sep. 11, 1970); Sano Tingsang–Thulo Tingsang, 3000 m (Sep. 26, 1970); Lukthang, 3300 m (Sep. 27, 1970).

Eriophyton Wallichianum Benth. in Wall., Pl. As. Rar. **1**: 63 (1830)–Fl. Brit. Ind. **4**: 695 (1885)–Mukerjee, Lab. Ind. 162 (1940)–Kitamura et Murata in Kihara, Fauna Fl. Nepal Himal. 211 (1955)–Murata in Act. Phytotax. Geobot. **24**: 81 (1969).

NEPAL. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Distr. Himalaya (Nepal to Bhutan), Tibet, and China (Yunnan).

Lamium album L.: Fl. E. Himal. **2**: 115 (1971).

NEPAL. Para Gaon–Khirojet, 2300–2250 m (Jun. 28, 1970).

Leonotis nepetaefolia R. Br., Prodr. 504 (1810)–Hook. in Bot. Mag. t. 3700 (1839)–Fl. Brit. Ind. **4**: 691 (1885)–Mukerjee, Lab. Ind. 185 (1940)–Kitamura et Murata in Kihara, Fauna Fl. Nepal Himal. 212 (1955)–Murata in Act. Phytotax. Geobot. **24**: 83 (1969).

NEPAL. Chaurangi Phedi–Gairi, 350–550 m (Jan. 8, 1970).

Distr. Africa, tropical Himalaya, tropical Asia, and America.

Leucas lanata Benth. in Wall., Pl. As. Rar. **1**: 61 (1830)–Fl. Brit. Ind. **4**: 681 (1885)–Mukerjee, l.c. 178 (1940)–Murata in S.E. Asian Studies **8**: 506 (1971).

L. collina Dalz. in Hook., Kew Journ. **2**: 338 (1850).

Marrubium mollissimum D. Don, Prodr. Fl. Nepal. 112 (1825).

NEPAL. Khanging–Syerpagaon, 2400 m (Jul. 11, 1970).

Distr. India, Himalaya (Nepal), Burma, and N. Thailand.

Leucas mollissima Wall.: Murata in Fl. E. Himal. 278 (1966); **2**: 115 (1971); in S.E. Asian Studies **8**: 507 (1971).

NEPAL. Godawari, 1500 m (Sep. 8, 1970).

Distr. India, Himalaya (Nepal), Burma, Thailand, Laos, Malaya, Vietnam, and China (Yunnan, Hupeh).

Melissa axillaris (Benth.) Bakh. f.: Fl. E. Himal. **2**: 115 (1971).

NEPAL. Chitre–Hile, 2200 m (Jul. 8, 1972).

DARJEELING. Raman–Rimbick, 2000 m (Aug. 5, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Melissa flava Benth.: Fl. E. Himal. **2**: 116 (1971).

NEPAL. Godawari–Phulchoki, 2700–3000 m (Jun. 10, 1969); Phulchoki, Kathmandu, 1970 m (Oct. 21, 1970).

Micromeria biflora Benth.: Fl. E. Himal. 279 (1966); **2**: 116 (1971).

NEPAL. Chobar, Kathmandu, 1200 m (Jun. 17, 1967); Shyaprubensi–Khanging, 1500–2300 m (Jul. 10, 1970); Barabise, 850 m (Sep. 9, 1970); Khosori Khabre, 1500 m (Sep. 12, 1970); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

Microtoena insuavis (Hance) Prain ex Briq. in Engl. et Prantl, Pfl.-fam. IV, **3a**: 269 (1897)–Murata in Fl. E. Himal. 279 (1966); in S.E. Asian Studies **8**: 508 (1971)–Keng in Gard. Bull. Sing. **24**: 117 (1969).

NEPAL. Dor–Chitre, 2300–2600 m (Jul. 7, 1972); Chitre, 2400 m Jul. 8, 1972).

Distr. Himalaya (Nepal to Assam), Thailand, Vietnam, Malaya, Sumatra, Java, New Guinea, and China (Yunnan, Kweichow, Kwangtung).

Nepeta lamiopsis Benth. ex Hook. f., Fl. Brit. Ind. **4**: 659 (1885)–Mukerjee, Lab. Ind. 124 (1940)–Kitamura et Murata in Kihara, Fauna Fl. Nepal Himal. 214 (1955)–Murata in Act. Phytotax. Geobot. **24**: 84 (1969).

NEPAL. Langtang–Kyangjing, 3600 m (Jul. 13, 1970); Topke Gola–Jalang Chhyongo, 3700 m (Jun. 20, 1972); Thudam, 3400 m (Jun. 22, 1972); Thudam–Lama Chungbu, 3500 m (Jun. 23, 1972); Lama Chungbu–Slesa, 4200–4500 m (Jun. 24, 1972); Kipuphu–Topke Gola, 3600–4800 m (Jun. 27, 1972); Topke Gola–Shewaden, 2600–3600 m (Jun. 28, 1972).

Distr. Himalaya (Nepal to Bhutan) and Tibet.

Notochaete hamosa Benth.: Fl. E. Himal. 279 (1966); **2**: 116 (1971).

NEPAL. Deorali, 1900 m (Sep. 2, 1970).

DARJEELING. Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Ocimum Basilicum L.: Murata in Fl. E. Himal. 279 (1966); in S.E. Asian Studies **8**: 509 (1971).

BHUTAN. Chimakhoti–Phuntsholing, 900–2000 m (Jun. 2, 1967).

Distr. India, Himalaya, S.E. Asia, S. China, Formosa, and Polynesia.

Origanum vulgare L.: Fl. E. Himal. **2**: 116 (1971).

NEPAL. Dunche–Singum Gompa, 1900–3000 m (Aug. 22, 1972).

Orthosiphon incurvus Benth.: Fl. E. Himal. 280 (1966).

NEPAL. Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

Phlomis breviflora Benth.: Fl. E. Himal. **2**: 116 (1971).

DARJEELING. Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

Phlomis macrophylla Wall., Pl. As. Rar. **1**: 62 (1830)–Fl. Brit. Ind. **4**: 692 (1885)–Mukerjee, Lab. Ind. 196 (1940)–Kitamura et Murata in Kihara, Fauna Fl. Nepal Himal. 215 (1955).

NEPAL. Oo Kharka–Mul Kharka, 3700 m (Jul. 1, 1970).

Distr. Himalaya (Punjab to Sikkim).

Phlomis rotata Benth. ex Hook. f.: Fl. E. Himal. **2**: 116 (1971).

NEPAL. Topke Gola–Jalang Chhyongo, 4100 m (Jun. 20, 1972).

Phlomis setigera Falc. ex Benth.: Fl. E. Himal. 280 (1966); **2**: 116 (1971).

NEPAL. Thudam, 3400 m (Jun. 22, 1972); Lama Chungbu–Thudam, 3400–4500 m (Jun. 24, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

Phlomis tibetica Marquand et Shaw: Fl. E. Himal. 280 (1966); **2**: 116 (1971).

NEPAL. Saju Pokhari, 4000 m (Jun. 15, 1972).

Plectranthus mollis (Ait.) Spreng., Syst. **2**: 690 (1825)–Santapau in Rec. Bot. Surv. Ind. **16**: 243 (1953)–Banerji in Rec. Bot. Surv. Ind. **19**: 76 (1966)–Murata in Act. Phytotax. Geobot. **24**: 86 (1969).

P. incanus Link, Enum. Hort. Berol. **2**: 120 (1822): Fl. E. Himal. 280 (1966).

Ocimum molle Ait., Hort. Kew. **2**: 322 (1789).

NEPAL. Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Distr. India, Himalaya (Nepal, Sikkim), and Khasia.

Pogostemon benghalensis (Burm. f.) O. Kuntze, Rev. Gen. Pl. 529 (1891)–Merr. in Philip. Journ. Sci. **19**: 378 (1921), ut *benghalense*.

Origanum benghalense Burm. f., Fl. Ind. 128, t. 38, fig. 3 (1768).

P. plectranthoides Desf. in Ann. Mus. Par. **2**: 155, t. 6 (1808)–Benth. in Wall., Pl. As. Rar. **1**: 31 (1830)–Hook. in Bot. Mag. t. 3238 (1833)–Fl. Brit. Ind. **4**: 632 (1885)–Mukerjee, Lab. Ind. 69 (1940).

Mentha secenda Roxb., Hort. Beng. 44 (1814), nom. nud.

O. indicum Roth, Nov. Sp. 265 (1821).

NEPAL. Patlaia–Sakti Mohar Khola, 200 m (Apr. 18, 1969); Nijgar, 200 m (Apr. 19, 1969); Dharan–Dhara Pani, 400–1300 m (Jun. 2, 1972).

Distr. India and Himalaya (Nepal).

Pogostemon glaber Benth. in Wall., Pl. As. Rar. **1**: 31 (1830)–Fl. Brit. Ind. **4**: 633 (1885)–Doan in Lecomte, Fl. Gén. Indo-Chine **4**: 973 (1936)–Mukerjee, Lab. Ind. 72 (1940)–Murata in S.E. Asian Studies **8**: 514 (1971).

NEPAL. Makwampur Garhi–Dunge Garhi, 600–1000 m (Nov. 16, 1970).

Distr. Himalaya (Nepal, Sikkim), Khasia, Thailand, Laos, and China (Yunnan).

Prunella vulgaris L.: Fl. E. Himal. 281 (1966); **2**: 117 (1971).

NEPAL. Mane Gaon–Thale, 1500 m (Jun. 24, 1970); Tingoang, 3100 m (Sep. 11, 1970); Nessum–Puntapla, 1900 m (Jul. 3, 1972); Chauke–Dor, 2600–2900 m (Jul. 6, 1972); Chitre–Teku Nala, 800–2400 m (Jul. 8, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972).

BHUTAN. Tamji–Gasa, 2200–2800 m (May 13, 1967).

Rabdosia Coetsa (Hamilt. ex D. Don) Hara in Journ. Jap. Bot. **47**: 194 (1972).

Isodon Coetsa (Hamilt. ex D. Don) Kudo: Murata in Fl. E. Himal. 275 (1966); in Act. Phytotax. Geobot. **24**: 82 (1969).

NEPAL. Phulchoki, 2000 m (Sep. 6, 1972).

Rabdosia lophanthoides (Hamilt. ex D. Don) Hara in Journ. Jap. Bot. **47**: 197 (1972).

Hyssopus lophanthoides Hamilt. ex D. Don, Prodr. Fl. Nepal. 110 (1825).

Isodon striatus (Benth.) Kudo: Fl. E. Himal. 277 (1966).

NEPAL. Makwampur Garhi–Dunge Garhi, 600–1000 m (Nov. 16, 1970); Thale Bisauna, 2800 m (Sep. 10, 1970).

Distr. Himalaya (Kashmir to Bhutan), Assam, Burma, Laos, Thailand, Vietnam, and S.W. China.

This is one of the very variable species in the Himalayan *Rabdosia.* The tall vigorous form with nearly glabrous oblong leaves is sometimes separated as var. *Gerardianus.*

Rabdosia phulchokiensis Murata, sp. nov.

Herba perennis. Caulis quadrangularis 40–100 cm altus ramosus pilis recurvatis breviusculis obtectus, internodiis 5–6 cm longis 2–3 mm crassis. Folia opposita petiolata, petiolis 6–20 mm longis, laminis ovatis vel ovato-oblongis 3–6 cm longis 2–3.5 cm latis, supra hirsutis, subtus glanduloso-punctatis et ad nervos hirsutis, nervis prominentibus, apice acutis, basi late cuneatis, margine serrato-dentatis, dentibus obtusis. Folia floralia conformia gradatim minora. Cymae e foliorum axillis longe pedunculatae 5–9-florae, pedunculis gracilimis 1–2 cm longis hirsutis, pedicellis 1–5 mm longis, bracteis oblongo-lanceolatis minutis. Calyx campanulatus 2 mm (in fructu 3 mm) longus, extus glanduloso-punctatus et piloso-tomentosus, intus glaber, 5-dentatus, dentibus deltoideis obtusis vel subacutis ca. 0.8 mm longis. Corolla 5.5–7 mm longa bilabiata; tubo brevi ad faucem gradatim dilatato non gibboso intus piloso, labio inferiore obovato naviculari 2.5 mm longo 2 mm lato apice rotundo, labio superiore 4-lobulato erecto nigro-purpureato quam inferiore multo breviore. Stamina stylisque longe excelta, filamentis ad basin pilosis, antheris nigro-purpuratis. Nuculae laeves.

NEPAL. Phulchoki, 2400–2700 m (Kanai & Chuma, Sep. 19, 1970, no. 17. Holotype in TI); loc. cit., 2540 m (Oct. 19, 1970, no. 674806).

This species is distinguished from *R. lophanthoides* in having dark brownish purple flowers and not elongated fruiting calyces.

Rabdosia repens (Wall.) Hara in Journ. Jap. Bot. **47**: 199 (1972).

Plectranthus repens Wall. ex Benth. in Wall., Pl. As. Rar. **2**: 17 (1830).

Isodon repens (Wall.) Murata: Fl. E. Himal. 276 (1966).

NEPAL. Thale Bisauna–Tingoang, 2750–3100 m (Sep. 11, 1970); Phulchoki, 2400–2700 m (Sep. 19, 1970); Thale–Jangdang Kharka, 3000 m (Sep. 23, 1970).

Rabdosia scrophularioides (Wall. ex Benth.) Hara in Journ. Jap. Bot. **47**: 200 (1972).

Plectranthus scrophularioides Wall. ex Benth. in Wall., Pl. As. Rar. **2**: 16 (1830).

Isodon scrophularioides (Wall. ex Benth.) Murata in Fl. E. Himal. 276 (1966); in Act. Phytotax. Geobot. **24**: 82 (1969).

NEPAL. Thale Bisauna, 2800 m (Sep. 10, 1970); Phulchoki, 2560 m (Oct. 20, 1970); Shewaden–Mewa Khola, 2200 m (Jun. 29, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972).

DARJEELING. Tonglu–Sandakphu, 2600–3000 m (Jul. 31, 1972).

Rabdosia ternifolia (D. Don) Hara in Journ. Jap. Bot. **47**: 201 (1972).

Isodon ternifolius (D. Don) Kudo: Murata in Fl. E. Himal. 277 (1966); in S.E. Asian Studies **8**: 504 (1971).

NEPAL. Makwampur Garhi–Dunge Garhi, 600–1000 m (Nov. 16, 1970).

Salvia campanulata Wall. ex Benth.

var. **hirtella** Stibal: Fl. E. Himal. 281 (1966).

NEPAL. Tingoang, 3100 m (Sep. 11, 1970).

DARJEELING. Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972).

In our specimens, the flowers are purplish red.

var. **nepalensis** Stibal in Fedde, Rep. **39**: 179 (1936)–Mukerjee, Lab. Ind. 114 (1940).

S. Smithii sensu Kitamura et Murata in Kihara, Fauna Fl. Nepal Himal. 215 (1955).

NEPAL. Tingoang, 3100 m (Sep. 12, 1970).

Distr. var. Himalaya (Nepal).

This variety is characterized in having yellow flowers and cupshaped calyces which are 4-gonous in bloom, truncate, and laterally much compressed after blooming.

Salvia coccinea L.: Murata in Fl. E. Himal. 281 (1966); in Act. Phytotax. Geobot. **24**: 87 (1969).

NEPAL. Godawari, south of Kathmandu (Sep. 8, 1970); Dingla–Doban, 800–1000 m (Jul. 2, 1972).

Distr. Introduced from Mexico.

Scutellaria barbata D. Don: Fl. E. Himal. **2**: 117 (1971).

NEPAL. Chobar, Kathmandu, 1200 m (Jun. 7, 1967); Godawari (Sep. 8, 1970).

Scutellaria discolor Colebr.: Murata in Fl. E. Himal. 281 (1966); in Act. Phytotax. Geobot. **24**: 88 (1969); in S.E. Asian Studies **8**: 515 (1971)–Keng in Gard. Bull. Sing. **24**: 165 (1969).

NEPAL. Nagarkot, 2000 m (Jun. 24, 1967); Godawari (Sep. 8, 1970); Khosori Khabre, 1500 m (Sep. 12, 1970); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Dingla–Nessum, 800–1900 m (Jul. 2, 1972); Dhara Pani–Sanguri Bhanjyang, 1000–1300 m (Jul. 10, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Distr. Himalaya, Assam, Thailand, Laos, Cambodia, Vietnam, China (Yunnan), and Malaysia (Sumatra to Moluccas).

Scutellaria grossa Wall. ex Benth. in Wall., Pl. As. Rar. **1**: 67 (1830)–Fl. Brit. Ind. **4**: 669 (1885)–Mukerjee, Lab. Ind. 146 (1940)–Kitamura et Murata in Kihara, Fauna Fl. Nepal Himal. 215 (1955)–Murata in Act. Phytotax. Geobot. **24**: 88 (1969).

NEPAL. Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

Distr. Himalaya (Kashmir to Bhutan).

Scutellaria repens Hamilt. ex D. Don: Murata in Fl. E. Himal. 281 (1966); in Act. Phytotax. Geobot. **24**: 88 (1969)–Banerji in Rec. Bot. Surv. Ind. **19**: 77 (1966).

NEPAL. Barabise–Thale, 850–2050 m (Sep. 9, 1970); Khosori Khabre, 1500 m (Sep. 12, 1970); Mokaibari, 2000 m (Sep. 30, 1970).

Scutellaria scandens D. Don: Fl. E. Himal. **2**: 117 (1971).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972).

Scutellaria violacea Heyne ex Benth. in Wall., Pl. As. Rar. **1**: 66 (1830)–Fl. Brit. Ind. **4**: 668 (1885)–Doan in Lecomte, Fl. Gén. Indo-Chine **4**: 1007 (1936)–

Mukerjee, Lab. Ind. 145 (1940)–Murata in S.E. Asian Studies **8**: 516 (1971).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Darjeeling, 2000 m (Jul. 25, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972); Palmajua–Batasi, 2100–2200 m (Aug. 8, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. India, Himalaya, Thailand, China (Kiangsi), and Java.

Stachys melissaefolia Benth.: Fl. E. Himal. **2**: 117 (1971).

NEPAL. Thale Bisauna–Tingoang, 2750–3100 m (Sep. 11, 1970); Tingoang–Khosori Khabre, 3000 m (Sep. 12 ,1970); Lukthang–Mogarcheko Danda, 3200–3400 m (Sep. 27, 1970); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

Teucrium quadrifarium Hamilt.: Murata in Fl. E. Himal. 282 (1966); in S.E. Asian Studies **8**: 516 (1971)–Keng in Gard. Bull. Sing. **24**: 175 (1969).

NEPAL. Makwampur Garhi–Dunge Garhi, 600–1000 m (Nov. 16, 1970).

Distr. Himalaya (Kashmir to Sikkim), Khasia, Burma, Thailand, Cambodia, Vietnam, Sumatra, and S. China.

Teucrium viscidum Blume: Murata in Fl. E. Himal. 282 (1966); in S.E. Asian Studies **8**: 517 (1971)–Keng in Gard. Bull. Sing. **24**: 176 (1969).

DARJEELING. Darjeeling–Kalimpong, 300–1300 m (Jun. 8, 1967).

Distr. Himalaya, India, S.E. Asia, China, Formosa, Korea, and S. Japan.

SCROPHULARIACEAE (by Takasi Yamazaki)

Lagotis Clarkei Hook. f., Fl. Brit. Ind. **4**: 559 (1885).

NEPAL. Kipuphu–Topke Gola, 3600–4800 m (Jun. 27, 1972, no. 72190).

Distr. Himalaya (E. Nepal to Sikkim).

Lagotis kunawurensis (Royle ex Benth.) Ruprecht in Mem. Acad. Sci. St.-Pétersb., ser. 7, **14**: 64 (1869)–Pennell in Acad. Nat. Sci. Philadelphia, Monogr. **5**: 68 (1943).

Gymnandra kunawurensis Royle ex Bentham, Scroph. Ind. 47 (1835).

L. glauca Gaertn. var. *kunawurensis* (Royle ex Benth.) Hook. f., Fl. Brit. Ind. **4**: 560 (1885).

L. glauca Gaertn. var. *sikkimensis* Hook. f., l.c. 560 (1885).

L. kunawurensis var. *sikkimensis* (Hook. f.) Yamazaki in Fl. E. Himal. 286 (1966).

Distr. Himalaya (Baltistan to Bhutan) and S.E. Tibet.

Hooker f. recognized three varieties in *L. glauca*, i.e., var. *cashmeriana*, var. *kunawurensis* and var. *sikkimensis*. But, one of them is *Lagotis cashmeriana* (Royle) Ruprecht, and the other two are identical.

Lagotis pharica Prain in Journ. Asiat. Soc. Beng. **65**: 62, pl. 1 (1896)–Li in Brittonia **8**: 24 (1954)–Yamazaki in Journ. Jap. Bot. **46**: 244 (1971).

L. ramalana (non Batalin) Yamazaki in Fl. E. Himal. **2**: 119 (1971), p.p.

Lindenbergia Hookeri C. B. Clarke in Fl. Brit. Ind. **4**: 261 (1884)–Yamazaki in Journ. Jap. Bot. **46**: 244 (1971).

L. bhutanica Yamazaki in Journ. Jap. Bot. **45**: 145, pl. 9 (1970); Fl. E. Himal. **2**: 119 (1971).

Distr. E. Himalaya (Sikkim to Bhutan).

Pedicularis albiflora (Hook. f.) Prain in Journ. Asiat. Soc. Beng. **58**: 273 (1889); in Ann. Bot. Gard. Calc. **3**: 156, pl. 17 C, D (1890)–Tsoong in Bull. Brit.

Mus. Bot. **2**: 31 (1955).

P. asplenifolia Floerke var. *albiflora* Hook. f., Fl. Brit. Ind. **4**: 315 (1884).

NEPAL. Hile Chok-Ghopte, 4100 m, (Jun. 12, 1972, corolla lips pale yellow, helmet yellow with purple patches); Saju Pokhari–Topke Gola, 4000–4400 m (Jun. 16, 1972, flowers yellow); Thudam–Kipuphu, 4300 m (Jun. 26, 1972, flowers yellow).

Distr. E. Himalaya (Nepal to Bhutan).

Pedicularis bifida (Buch.-Ham.) Pennell in Acad. Nat. Sci. Philadelphia, Monogr. **5**: 144 (1943)–Yamazaki in Kihara, Fauna Fl. Nepal Himal. 218 (1955)–Tsoong in Bull. Brit. Mus. Bot. **2**: 31 (1955).

Rhinanthus bifidus Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 94 (1825).

P. carnosa Wall., Pl. As. Rar. **2**: 44, t.154 (1831)–Fl. Brit. Ind. **44**: 313 (1884)–Prain in Ann. Bot. Gard. Calc. **3**: 151, pl. 14A (1891).

NEPAL. Tanguni–Chipling, 2150 m (Aug. 21, 1969, fl. rose); Deorali–Chitalang, 1900 m (Sep. 3, 1970, fl. pink); Barabise–Thale, 1800 m (Sep. 9, 1970); Gram–Thale, 1900 m (Aug. 21, 1972).

Distr. Himalaya (Kangra, Nepal to Bhutan).

Pedicularis diffusa Prain in Journ. Asiat. Soc. Beng. **62**: 7, t. 1 (1893)–Tsoong in Fl. Reip. Popul. Sin. **68**: 185, pl. 40, 1–4 (1963).

NEPAL. Janga La, 4450 m (Jun. 21, 1972).

Distr. E. Nepal, Sikkim, and S.E. Tibet.

Pedicularis Elwesii Hook. f., Fl. Brit. Ind. **4**: 312 (1884)–Prain in Ann. Bot. Gard. Calc. **3**: 127, pl. 8A (1890)–Li in Proc. Acad. Nat. Sci. Philadelphia **101**: 144, pl. 12, f. 192 (1949)–Yamazaki in Kihara, Fauna Fl. Nepal Himal. 219 (1955)–Tsoong in Fl. Reip. Popul. Sin. **68**: 323, f. 73, 1–3 (1963).

NEPAL. Jalang Chhyongo–Janga La, 4200–4600 m (Jun. 21, 1972); Thudam–Lama Chungbu, 4500 m, (Jun. 23, 1972, fl. rose purple); Thudam–Kipuphu, 4200–4500 m (Jun. 26, 1972).

Distr. E. Himalaya (E. Nepal to Bhutan), S.E. Tibet, and W. China (Yunnan).

Pedicularis gracilis Wall. ex Bentham, Scroph. Ind. 52 (1835)–Prain in Ann. Bot. Gard. Calc. **3**: 137, pls. 19 & 20D (1890)–Pennell, l.c. 131 (1943)–Tsoong in Act. Phytotax. Sin. **3**: 307 (1954); in Fl. Reip. Popul. Sin. **68**: 78 (1963).

P. stricta Wall., Cat. no. 414 (1829), nom. nud.–Bentham, Scroph. Ind. 52 (1835), in syn.

P. Brunoniana Wall., Cat. no. 422 (1829), nom. nud.–Bentham, l.c. 52 (1835), in syn., non Pennell (1943).

P. gracilis Wall. var. *typica* f. *vera*, f. *stricta* et f. *prostrata* Prain in Ann. Bot. Gard. Calc. **3**: 137–138 (1890).

P. gracilis Wall. subsp. *stricta* (Wall. ex Prain) Tsoong in Act. Phytotax. Sin. **3**: 307 (1954); in Fl. Reip. Popul. Sin. **68**: 78 (1963).

NEPAL. Tharpu Khunga, 1200–2700 m (Nov. 27, 1963); Baroya Khimty–Thakma Khora (Nov. 12, 1963); Thale–Thale Bisauna, 2700 m & 2800 m (Sep. 10, 1970); Phulchoki, south of Kathmandu, 2500 m (Sep. 18, 1970, fl. pink).

Distr. Himalaya (Hazara to E. Nepal).

Pedicularis kansuensis Maxim. in Bull. Acad. Sci. St.-Pétersb. **27**: 516 (1881); **32**: 596, f. 116 (1888)–Tsoong in Fl. Reip. Popul. Sin. **68**: 167, pl. 33, 5–8

(1963).

NEPAL. Thudam–Lama Chungbu, 4160 m (Jun. 24, 1972).

Distr. Himalaya (E. Nepal), Tibet, and China (Sikang and Kansu). New to Nepal.

Pedicularis lamjungensis Yamazaki in Journ. Jap. Bot. **45**: 167, f. 11 & 17 (1970).

NEPAL. Mul Kharka, Chilime Khola, 4000 m (Jul. 3, 1970).

Distr. Himalaya (C. Nepal).

Pedicularis longiflora Rudolph var. **tubiformis** (Klotz.) Tsoong in Act. Phytotax. Sin. **3**: 278 (Jan. 1955); in Bull. Brit. Mus. Bot. **2**: 7 (Nov. 1955); in Fl. Reip. Popul. Sin. **68**: 365 (1963).

P. tubiformis Klotz. in Klotz. et Garcke, Bot. Ergebn. Reis. Prinz. Waldem. 106, t. 57 (1862).

P. tubiflora Fischer sensu Hook. f., Fl. Brit. Ind. **4**: 315 (1884), p. p.

P. longiflora Rudolph subsp. *tubiformis* (Klotz.) Pennell, l.c. 150 (1943).

NEPAL. Kyangjing, Langtang Khola, 3600 m (Jul. 14, 1970, fl. yellow with dark brownish purple spots).

Distr. Himalaya (Baltistan to Bhutan), S.E. Tibet, and China (Sikang and Yunnan).

Pedicularis microcalyx Hook. f., Fl. Brit. Ind. **4**: 315 (1884)–Prain in Ann. Bot. Gard. Calc. **3**: 149, pl. 16, C (1890)–Tsoong in Bull. Brit. Mus. Bot. **2**: 33 (1955); in Fl. Reip. Popul. Sin. **68**: 140 (1963).

NEPAL. Ghopte–Gosa, 3500–4100 m (Jun. 13, 1972); Topke Gola, 3700 m (Jun. 19, 1972, fl. pink); Thudam–Kipuphu, 3700 m (Jun. 26, 1972, fl. rose).

Distr. E. Himalaya (E. Nepal to Bhutan) and S.E. Tibet.

Pedicularis Oederi Vahl var. **heteroglossa** Prain in Journ. Asiat. Soc. Beng. **58**: 276, pl. 2 (1889); in Ann. Bot. Gard. Calc. **3**: 182, pl. 34, B, C (1890)–Pennell, l.c. 141 (1943)–Tsoong in Fl. Reip. Popul. Sin. **68**: 332 (1963), ut *P. oederi* subsp. *oederi* var. *heteroglossa.*

NEPAL. Lama Chungbu–Slesa, 4500 m. (Jun. 24, 1972, fl. yellow, helmet purplish).

Distr. Himalaya (Tehri to E. Nepal) and S.E. Tibet.

Pedicularis Pennelliana Tsoong in Act. Phytotax. Sin. **3**: 307 (1955), ut *pannelliana.*

P. gracilis Wall. var. *macrocarpa* Prain in Ann. Bot. Gard. Calc. **3**: 138, pl. 20, A–C (1890).

P. Brunoniana Wall. ex Pennell, l.c. 128 (1943), non Wall.

P. gracilis Wall. var. *sinensis* Li in Proc. Acad. Sci. Philad. **100**: 279, pl. 16, f. 15 (1948).

P. gracilis Wall. subsp. *macrocarpa* (Prain) Tsoong in Act. Phytotax. Sin. **3**: 307 (1955).

P. gracilis Wall. subsp. *sinensis* (Li) Tsoong in Fl. Reip. Popul. Sin. **68**: 79 (1963).

NEPAL. Tsedang Pokhari–Panghu Danda, 3000–3100 m (Aug. 23, 1969); Langtang Gorge–Langtang, 3000 m (Jul. 12, 1970); Thale Bisauna–Tingoang, 3000 m (Sep. 11, 1970); Tingoang–Khosori Khabre, 3100 m (Sep. 12, 1970); Kuri–Charikot, 3100 m (Sept. 29, 1970); Singum Gompa, 3600 m (Aug. 23, 1972); Gopte–Thale Patil, 3200–

3500 m (Aug. 26, 1972); Mangen, 3100 m (Aug. 28, 1972).

DARJEELING. Kala Pokhari–Sandakphu (Sep. 16, 1964); Sandakphu-Gairibas, 3400 m (Sep. 17, 1964); Sandakphu, 3600 m (Aug. 1, 1972).

Distr. Himalaya (Bashar to Bhutan) and W. China (S.E. Sikang, Yunnan).

Pedicularis Pennelliana seems to be a distinct species occuring in the higher Himalayan range and western China. This is similar to *P. gracilis* in habit. The former has the somewhat swollen and much pilous (sometimes glabrous) calyx. The calyx-lobes, the length of which is not exceeding their width, have apparently dentate and everted margin. The capsules of *P. Pennelliana* are narrowly ovoid-ensiform and 7–11 mm long 3–4 mm broad. However, *P. gracilis* has the narrow and glabrous calyx. The calyx-lobes, the length of which is exceeding the width, have rounded and ciliolate margin. The capsules of this species are ovoid or narrowly ovoid and 6–9 mm long 3–5 mm broad.

P. gracilis var. *macrocarpa* and var. *sinensis* resembles more *P. Pennelliana* than *P. gracilis*. According to Pennell, *P. gracilis* is an annual and *P. Pennelliana* is a perennial, but the latter seems to be annual or biennial. Therefore, they cannot be distinguished from each other by the growth form.

Pedicularis porrecta Wall. ex Bentham, Scroph. Ind. 52 (1835)–Prain, l.c. 141, pl. 20, A–C (1890)–Pennell, l.c. 128 (1943).

NEPAL. Gadje–Surjakund, 4000 m (Aug. 26, 1969).

Distr. Himalaya (Chamba to Sikkim).

Pedicularis pseudoregeliana Tsoong in Bull. Brit. Mus. Bot. **2**: 11 (1955).

NEPAL. Gosainkund–Surjakund, 4400 m (Aug. 26, 1969); Gosa, 4100 m. (Jun. 14, 1972, fl. dark rose, lower lips pink).

Distr. Himalaya (Central and Eastern Nepal).

Pedicularis Regeliana Prain in Journ. Asiat. Soc. Beng. **58**: 274 (1889); in Ann. Bot. Gard. Calc. **3**: 169, pl. 10, C (1890)–Tsoong in Bull. Brit. Mus. Bot. **2**: 33 (1955).

NEPAL. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972, fl. reddish pink); Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Singum Gompa–Gosainkund, 3900 m (Aug. 23, 1972).

DARJEELING. Phalut–Singalila, 3200 m (Aug. 3, 1972, fl. rose).

Distr. E. Himalaya (C. Nepal to Bhutan).

Pedicularis Roylei Maxim. in Bull. Acad. Imp. Sci. St.-Pétersb. **27**: 517 (1881)–Prain in Ann. Bot. Gard. Calc. **3**: 173, pl. 33, B, C (1890)–Pennell, l.c. 119 (1943)–Li in Proc. Acad. Nat. Sci. Philad. **100**: 321, f. 46 (1948)–Tsoong in Fl. Reip. Popul. Sin. **68**: 157 (1963).

P. verticillata L. sensu Hook. f., Fl. Brit. Ind. **4**: 309 (1884).

P. rupicoloides Yamazaki in Act. Phytotax. Geobot. **15**: 147 (1954); in Kihara, Fauna Fl. Nepal Himal. 221, f. 57, 58 (1955).

NEPAL. Gosa, near Kobche, 4100 m (Jun. 14, 1972); Saju Pokhari–Topke Gola, 4000 m (Jun. 16, 1972); Topke Gola–Jalang Chhyongo, 4000 m (Jun. 20, 1972, no. 720628, fl. pink); Jalang Chhyongo–Janga La, 4200–4600 m (Jun. 21, 1972).

Distr. Himalaya (Hazara to Bhutan), S.E. Tibet, and China.

Pedicularis rupicoloides of C. Nepal was characterized by the larger corolla and the shallowly lobed leaves, but is identical with *P. Roylei* subsp. *megalantha* Tsoong. The subspecies was described from Sikang but occurs also in Marma, W. Nepal (Stainton no. 4959).

Pedicularis schizorrhincha Prain in Journ. Asiat. Soc. Beng. **58**: 260 (1889); in Ann. Bot. Gard. Calc. **3**: 163, pl. 25,C (1891)–Tsoong in Fl. Reip. Popul. Sin. **68**: 305, pl. 67, 3–5 (1963).

NEPAL. Gosainkund, 4200 m (Aug. 26, 1969; Aug. 24, 1972).

Distr. E. Himalaya (C. Nepal to Bhutan) and S.E. Tibet.

Pedicularis Scullyana Prain ex Maxim. in Bull. Acad. Sci. St.-Pétersb. **32**: 529, t.1, 6 (1888)–Prain in Ann. Bot. Gard. Calc. **3**: 127, pl. 9, A–C (1890)–Tsoong in Bull. Brit. Mus. Bot. **2**: 34 (1955), ut *sculleyana*–Yamazaki in Kihara, Fauna Fl. Nepal Himal. 224 (1955).

NEPAL. Kyangjing, 3800 m (Jul. 13, 1960); Gotiora-Gadje, 3300-3700 m (Aug. 25. 1969, fl. yellow); Gosainkund, 4200 m (Aug. 26, 1969, fl. yellow); Topke Gola-Jalang Chhyongo, 3700 m (Jun. 20, 1972, fl. yellow); Singum Gompa-Gosainkund, 3200-4200 m (Aug. 23, 1972, fl. yellow).

Distr. Himalaya (Nepal and Sikkim).

Pedicularis siphonantha D. Don, Prodr. Fl. Nepal. 95 (1825)–Prain in Ann. Bot. Gard. Calc. **3**: 113, pl. 2, A (1890), p. p.–Pennell, l.c. 156 (1943)–Tsoong in Fl. Reip. Popul. Sin. **68**: 373,pl. 87, 4–6 (1963).

P. Hookeriana Wall. sensu Yamazaki in Kihara, Fauna Fl. Nepal Himal. 220 (1955).

NEPAL. Gosainkund, Tsedang Pokhari, 3000 m (Aug. 23, 1969, fl. pink); Langtang-Kyangjing, 3500 m (Jul. 13, 1970); Mogaecheko Danda, 3400 m (Sep. 27, 1970); Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Saju Pokhari–Topke Gola, 4000 m (Jun. 16, 1972); Topke Gola, 3600 m (Jun. 17, 1972); Lama Chungbu-Slesa, 4200–4500 m (Jun. 24, 1972); Thudam, 3400 m (Jun. 25, 1972); Singum Gompa-Gosainkund, 3200–4200 m (Aug. 23, 1972).

SIKKIM. Jongri, 4100 m (May 23, 1960, no. 6023).

BHUTAN. Chomolhari, Chakan, 4100 m (Nishioka, Sep. 6, 1966, no. 11199).

Distr. E. Himalaya (C. Nepal to Bhutan).

Pedicularis Hookeriana of the central Himalaya was distinguished by Pennell (1943) from *P. siphonantha* of the eastern Himalaya, but many intermediate forms are found in central and eastern Nepal. It seems to be more suitable that *P. Hookeriana* is regarded as a geographic subspecies of *P. siphonantha*, but it may be necessary to reinvestigate based on ample material.

Pedicularis terrenoflora Yamazaki, sp. nov. (Ser. Curvipes).

Caulis gracilis prostratus 10–20 cm longus patente fuscato-villosus. Folia radicalia majora, petiolis 3–4 cm longis patente villosis, laminis oblongo-ovatis 2.5–3 cm longis 1.8–2 cm latis pinnatisectis, segmentis 4–6 jugis ovato-oblongis acutis pinnatipartitis, laciniis oblongis arguti-serractis. Folia caulina petiolis 0.5–1 cm longis patente fuscato-villosis, laminis oblongo-ovatis vel ovatis 1–2 cm longis 0.8–1.5 cm latis supra glabris subtus pilosis pinnatipartitis, segmentis ovatis vel oblongis acutis pinnatifidis, lobis arguti-serratis. Flores ad axillares foliorum solitarii, pedicellis erectis 3–8 mm longis patente fuscato-villosis. Calyx tubuloso-cam-

panulatus amplicollis apice 5-lobatus 8–10 mm longus 3–4 mm latus, tubo 6–8 mm longo patente fuscato-villoso, lobis 4 lateralibus ovatis vel orbiculato-ovatis argute inciso-serratis 2–3 mm longis 1.5–2 mm latis glabris, lobo postico subminore rare subnullo. Corolla 20–22 mm longa, tubo recto 15–17 mm longo 2 mm lato calyce subduplo longiore glabro. Galea arcuato-incurva glabra, pars antherigera ca. 2. 5 mm lata, margine antice ad medium breviter bidentata sparse punctata, rostro subarcuato ca. 5 mm longo apice integro, labio inferiore dilatato ca. 10 mm longo et lato margine minutissime piloso 3-lobato, lobis lateralibus majoribus, lobo medio parvo 3.5 mm longo 7 mm lato apice emarginato. Stamina infra tubum inserta, filamentis anticis glabris posticis sparse pilosis. Capsula ignota.

P. amplicollis affinis, sed a qua caulibus repentissimis patente fuscato-villosis, serris foliorum argutioribus, lobis calycis majoribus differt.

Nepal. Shewaden–Mewa Khola, 2200 m. On rock with mosses. Flowers pink. (Kanai, Ohashi, K. Iwatsuki, Ohba, Z. Iwatsuki & Shakya, Jun. 29, 1972, no. 720925. Holotype in TI).

Pedicularis Wallichii Bunge ex Walper, Rep. Bot. Syst. **3**: 415 (1844)–Prain in Ann. Bot. Gard. Calc. **3**: 156, pl. 17, A–B (1890)–Tsoong in Fl. Reip. Popul. Sin. **68**: 342, pl. 78, 5 (1963).

Nepal. Hile Chok–Ghopte, 4100 m (Jun. 12, 1972, lips pink, helmet purple); Ghopte–Gosa, 3500–4100 m (Jun. 13, 1972); Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Saju Pokhari–Topke Gola, 4000 m (Jun. 16, 1972); Topke Gola, 3600 m (Jun. 17, 1972).

Distr. E. Himalaya (C. Nepal to Bhutan), S.E. Tibet, and W. China (Sikang).

Pedicularis Wallichoides Yamazaki in Journ. Jap. Bot. **46**: 246, f. 3, pl. 12, 5 (1971).

Nepal. Mul Karka, Chilime Khola, 3800–4000 m (Jul. 3, 1970).

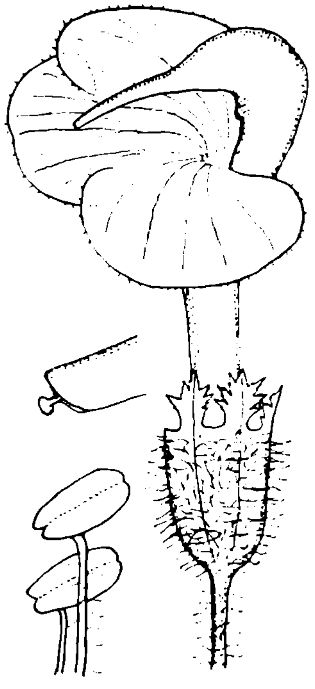

Fig. 11. Flower of *Pedicularis terrenoflora* Yamazaki, ×6.

Distr. Himalaya (W. and C. Nepal).

Scrophularia pauciflora Bentham in Scroph. Ind. 17 (1835)–Fl. Brit. Ind. **4**: 253 (1883).

S. sikkimensis Yamazaki in Journ. Jap. Bot. **37**: 263, f. 1, 1-2 (1962); in Fl. E. Himal. 290 (1966); **2**: 120 (1971), syn. nov.

Distr. E. Himalaya (E. Nepal to Bhutan).

Scrophularia pauciflora was described by Bentham and by Hooker f. as having no staminodium, but this character is variable and some specimens from eastern Nepal have a small sterile filament. Therefore, *S. sikkimensis* can not be distinguished from the former species.

Wulfenia Amherstiana (Wall.) Bentham

var. **nepalensis** (Yamazaki) Yamazaki in Journ. Jap. Bot. **46**: 249 (1971).

W. nepalensis Yamazaki in Journ. Jap. Bot. **45**: 177, f. 24, pl. 9 (1970); in Fl. E. Himal. **2**: 119 (1971).

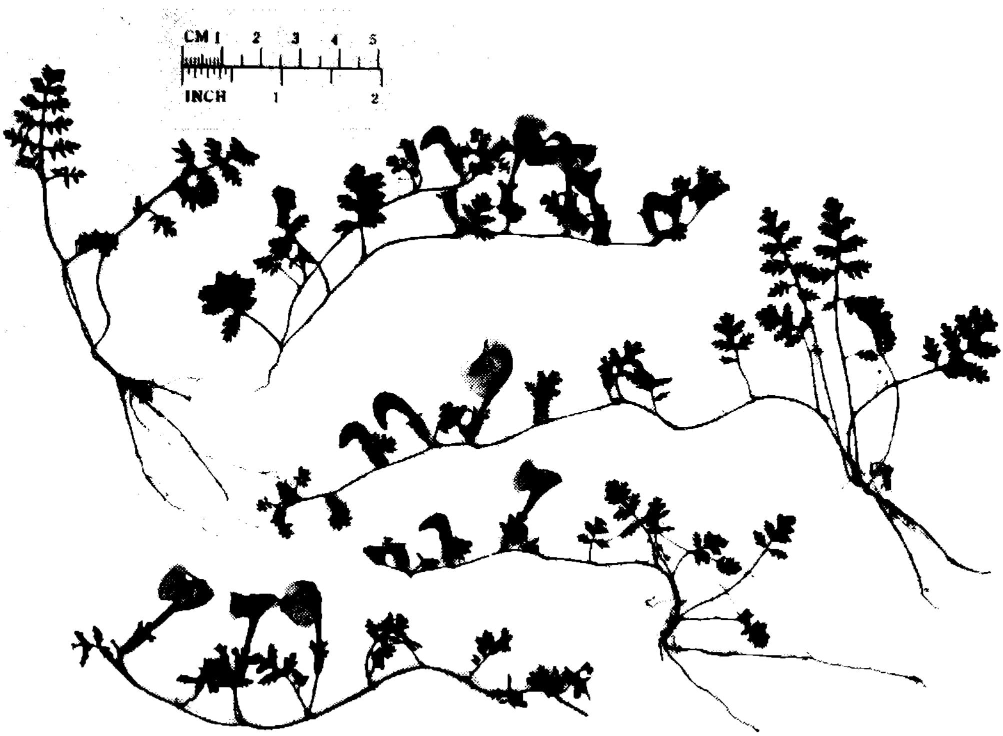

Fig. 12. *Pedicularis terrenoflora* Yamazaki.

Dist. Himalaya (C. Nepal).

GESNERIACEAE (by Hiroshi Hara)

Chirita calva C. B. Clarke in Fl. Brit. Ind. **4**: 358 (1884). [Plate 6b]

C. glabra (non Miquel, 1856) C. B. Clarke, Comm. et Cyrt. Beng. 105, t. 73 (1874).

Darjeeling. Raman-Rimbick, 1900-2400 m (Aug. 5, 1972, fl. purple).

Distr. Himalaya (Sikkim).

Didymocarpus aromaticus Wall. ex D. Don, Prodr. Fl. Nepal. 123 (1825), ut *aromatica*–Hara in Journ. Jap. Bot. **47**: 273 (1972).

D. subalternans Wall. [Cat. no. 782 (1829), nom. nud.] ex R. Brown in Bennett, Pl. Jav. Rar. 118 (1840)–C. B. Clarke in Fl. Brit. Ind. **4**: 347 (1884), cum var. *curvicapsa*.

Nepal. Duche Gyang–Thodang Danda, 2300 m (Aug. 22, 1969, fl. dark purple); Ramche–Gram, 1900 m (Aug. 20, 1972, no. 723137, fl.).

Distr. Himalaya (Kumaon to Sikkim).

The nomenclatural problems regarding the conserved genus *Didymocarpus* and the identity of the species *D. aromaticus* were discussed in detail by Hara (1972).

Didymocarpus cinereus D. Don, Prodr. Fl. Nepal. 122 (1825), ut *cinerea*–C. B. Clarke in Fl. Brit. Ind. **4**: 346 (1884).

D. obtusa Wall. [Cat. no. 786 (1829), nom. nud.] ex R. Brown in Bennett, l.c. 118 (1840)–C. B. Clarke, Comm. et Cyrt. Beng. 91, t. 61 (1874).

Nepal. Sundarijar–Mul Kharka, 1450 m (Aug. 20, 1969); Sim Chotala–Ramche, 1300 m (Aug. 20, 1972, no. 721657, fl. violet-purple).

Distr. Himalaya (Nepal).

Didymocarpus oblongus Wall. ex D. Don, Prodr. Fl. Nepal. 123 (1825), ut *oblonga*-Wall., Pl. As. Rar. **2**: 34, t. 140 (1831)-C. B. Clarke, Comm. et Cyrt. Beng. 86, t. 56 (1874); in Fl. Brit. Ind. **4**: 346 (1884).

NEPAL. Phulchoki, Kathmandu, 2000 m (Aug. 9, 1969, fl.); Shewaden-Papung, 2600-2000 m (Jun. 29, 1972, no. 723133, fl.); Papung-Bir Gaon, 1800 m (Jun. 30, 1972, fl.); Nessum-Bhuje, 1300-2700 m (Jul. 3, 1972, fl.).

Distr. Himalaya (Nepal, Sikkim) and Assam.

Didymocarpus pedicellatus R. Brown in Bennett, Pl. Jav. Rar. 118 (1840)-C. B. Clarke, Comm. et Cyrt. Beng. 94, t. 64 (1874); in Fl. Brit. Ind. **4**: 345 (1884).

NEPAL. Sim Bhanjyang, 2500 m (Jul. 26, 1969); Saju Khola-Dingla, 1200 m (Jul. 1, 1972, no. 720996, fl. deep purple glossy).

Distr. Himalaya (Punjab to Bhutan).

Didymocarpus primulifolius D. Don, Prodr. Fl. Nepal. 123 (1825), ut *primulifolia*-Hara in Journ. Jap. Bot. **47**: 273 (1972).

D. aromatica Wall. [Cat. no. 785 (1829), nom. nud.] Pl. As. Rar. **2**: 34, t. 141 (1831), excl. figs. 4–7–R. Brown in Bennett, Pl. Jav. Rar. 118 (1840)-C. B. Clarke, Comm. et Cyrt. Beng. 87, t. 57 (1874), excl. fig. pl. fr.; in Fl. Brit. Ind. **4**: 347 (1884); non *D. aromatica* Wall. ex D. Don (1825).

D. oblongus Wall. ex D. Don sensu Hara, Fl. E. Himal. **2**: 122 (1971).

NEPAL. Khirojet-Yatumbal, 2500 m (Jun. 29, 1970, fl.); Langtang Gorge-Syerpagaon, 2500 m (Jul. 17, 1970, fl.); Phulchoki, 2200–2700 m (Jul. 15, 1972, fl. dark violet-purple).

Distr. Himalaya (Nepal).

Didymocarpus pulcher C. B. Clarke in DC., Mongr. Phan. **5**: 79 (1883), ut *pulchra*; in Fl. Brit. Ind. **4**: 348 (1884).

D. subalternans DC. sensu C. B. Clarke, Comm. et Cyrt. Beng. 85, t. 55 (1874).

DARJEELING. Observatory Hill, 2200 m (Jul. 24, 1972, fl.); Raman-Rimbick, 2400–1900 m (Aug. 5, 1972, fl.); Rimbick-Palmajua, 2100 m (Aug. 6, 1972, no. 721526, fl. purple); Palmajua, 2200 m (Aug. 7, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan).

The plant is very near to *D. aromaticus* Wall. ex D. Don, but has generally larger corollae and calyces, and longer capsules.

Lysionotus atropurpureus Hara in Journ. Jap. Bot. **48**: 359, f. 4 (1973). [Plate 6a]

L. ternifolia DC. sensu C. B. Clarke, Comm. et Cyrt. Beng. 81 (1874), p.p.

L. serrata D. Don sensu C. B. Clarke in Fl. Brit. Ind. **4**: 344 (1884), p.p.: Hara, Fl. E. Himal. 299 (1966), p.p.

NEPAL. Mul Pokhari-Gorzu Kosir, 2200 m (Oct. 30, 1963, fr.); Bhandukay Bhanjyang, 3000–2000 m (Dec. 3, 1963, fr.).

DARJEELING. Birch Hill, 2100 m (Apr. 7, 1960, fr.); Kurseong, 1600 m (Apr. 12, 1960, fr.); Rimbick, 2200 m (May 6, 1960, fr.); Siri Khola-Rimbick, 2100–2200 m (Aug. 5, 1972, no. 723147, fl. Holotype in TI); Palmajua, 2200 m (Aug. 7, 1972, fl.); Palmajua-Batasi, 2200–2100 m (Aug. 8, 1972, fl.).

Distr. E. Himalaya (Nepal, Sikkim).

This species is clearly separated from *L. serratus* D. Don by axillary filiform spreading peduncles, smaller dark violet-purple corollae which are quite glabrous outside, more spreading calyx-lobes, and shorter styles about 5 mm long.

Lysionotus serratus D. Don: Hara, Fl. E. Himal. 299 (1966), ut *serrata*, p.p.

NEPAL. Sim Chotala–Gram, 1000–1800 m (Aug. 20, 1972, fl. mauve).

BHUTAN. Phuntsholing, 900 m (Apr. 3, 1967, fr.); Punakha–Bhotokha, 1450 m (May 7, 1967, fr.).

Distr. Himalaya (Kumaon to NEFA), Assam, and N. Burma.

Platystemma violoides Wall.: Hara, Fl. E. Himal. **2**: 122 (1971).

[Plate 6c]

NEPAL. Phulchoki, 2700 m (Aug. 9, 1969, fl.); Trisuli Khola, 2000 m (Aug. 22, 1972, no. 721787, fl. violet).

Distr. Himalaya (Simla to Bhutan).

CAPRIFOLIACEAE (by Hiroshi Hara)

Lonicera asperifolia (Decaisne) Hook. f. et Thoms.: Hara, Fl. E. Himal. **2**: 125 (1971).

NEPAL. Lama Chungbu, 4200 m (Jun. 23, 1972, no. 720697, fl. cream); Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972).

Distr. Turkestan, Himalaya (Kashmir to Bhutan), and Tibet.

Lonicera lanceolata Wall.: Fl. E. Himal. **2**: 125 (1971).

NEPAL. Topke Gola, 3600 m (Jun. 28, 1972, no. 723978, fl.).

Distr. Himalaya (Nepal to Bhutan), S. Tibet, N. Burma, and W. China.

Lonicera myrtilloides Purpus: Fl. E. Himal. **2**: 125 (1971).

NEPAL. Topke Gola, 3600 m (Jun. 18, 1972, fl.); Thudam, 3400 m. (Jun. 22, 1972, fl.; Jun. 24, 1972, fl. pinkish); Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972, no. 723983, fl.).

Distr. E. Himalaya (Nepal, Sikkim).

Lonicera Myrtillus Hook. f. et Thoms.: Fl. E. Himal. **2**: 126 (1971).

NEPAL. Topke Gola, 3600 m (Jun. 19, 1972, no. 720558, fl.); Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972, fl.).

Distr. Himalaya (Kashmir to Bhutan), S. Tibet, N. Burma, and W. China.

Lonicera rupicola Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 168 (1858)–C. B. Clarke in Fl. Brit. Ind. **3**: 13 (1880)–Rehder, Syn. Lonicera 46 (1903).

NEPAL. Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972, fl.).

Distr. Himalaya (Kumaon to Bhutan), S. Tibet, and ?W. China.

Viburnum cylindricum Hamilt. ex D. Don, Prodr. Fl. Nepal. 142 (1825).

V. coriaceum Blume, Bijdr. 656 (1826)–Hara, Fl. E. Himal. 319 (1966); **2**: 127 (1971).

Distr. Himalaya (Kumaon to NEFA), Assam, N. Burma, Indo-China, W. China, and Malaysia.

Kern (in Reinwardtia **1**: 118, 1951) had doubts about the identity of *Viburnum cylindricum* Hamilt. ex D. Don judged from the original description. However, having examined its holotype (Nepal, ad Narainhetty, Hamilton in BM), I noticed that the leaves are glabrous beneath excepting the axils of veins, and the type is quite identical with the plants called *V. coriaceum* Blume.

Viburnum nervosum D. Don, Prodr. Fl. Nepal. 141 (1825)–Stapf in Bot. Mag. t. 9063, in textu (1925)–Hara in Journ. Jap. Bot. **47**: 275 (1972).

V. cordifolium Wall. ex DC.: Fl. E. Himal. 319 (1966); **2**: 127 (1971).

Distr. Himalaya (Kumaon to Bhutan), N. Assam, S. Tibet, N. Burma, and W. China.

Following the opinion of Dr. Stapf, I adopted *Viburnum nervosum* D. Don for *V. cordifolium* Wall., although D. Don's type is missing.

VALERIANACEAE (by Hiroshi Hara)

Nardostachys grandiflora DC., Prodr. **4**: 624 (1830); Mém. Valér. 8, t. 2 (1832).

Valeriana Jatamansi Jones sensu D. Don in Lambert, Ill. Cinchona 180, t. (1821)–Wall., Cat. no. 431 (1829).

Patrinia Jatamansi D. Don, Prodr. Fl. Nepal. 159 (1825), quoad descr., excl. basionym et syn. Vahl.

Fedia grandiflora Wall., Cat. no. 1187 (1829), nom. nud.

N. Jatamansi DC., Prodr. **4**: 624 (1830), quoad descr. tantum, excl. basionym et syn. Vahl; Mém. Valér. 7, t. 1 (1832)–Royle, Ill. Bot. Himal. 242, t. 54 (1835–36?)–C. B. Clarke in Fl. Brit. Ind. **3**: 211 (1881)–Hook. f. in Bot. Mag. t. 6564 (1881).

N. gracilis Kitamura in Act. Phytotax. Geobot. **15**: 134 (1954); in Kihara, Fauna Fl. Nepal Himal. 235, f. 64 (1955).

NEPAL. Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972); Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972, fl.); Phujeng La–Topke Gola, 3900 m (Jun. 27, 1972, fl.).

BHUTAN. Below Tremo La, 4500 m (Nishioka, Jun. 23, 1966, fl.).

Distr. Himalaya (Garhwal to Bhutan), Tibet, and W. China.

The plant name of a famous Indian drug 'Jatamansi' (Indian Spikenard) which is the rhizome of *Nardostachys* is very confusing.

In 1770 Jones first published a name *Valeriana Jatamansi* for a plant which he supposed to be 'Jatamansi', but the flowering plant described by him with figures was different from true 'Jatamansi', and was a species of *Valeriana* in the present sense. Roxburgh in 1795 illustrated *Valeriana Jatamansi* in colour, but it was also a mixture of the flowering plant of *Valeriana* and the rhizome of *Nardostachys*. D. Don (1821) is the first botanist who observed a real plant of 'Jatamansi' (*Nardostachys*) and in 1825 he described it as *Patrinia Jatamansi* in his Prodr. Fl. Nepal. p. 159, but he cited *Valeriana Jatamansi* Jones and also *V. spica* Vahl as a synonym which is not *Nardostachys*. Presumably D. Don considered that *Valeriana Jatamansi* Jones is a mixture of two different plants, and tried to restrict his *Patrinia Jatamansi* to true 'Jatamansi'. In other words, *Patrinia Jatamansi* D. Don is not a new name, but still derived from *Valeriana Jatamansi* Jones, and he intended to select true 'Jatamansi' as its lectotype.

DC. in his Mém. Valér. (1832) clearly described and illustrated 'Jatamansi' as *Nardostachys Jatamansi*. But this name was first published by DC. in his Prodr.

4 (1830), and his treatment there is almost the same as in the case of D. Don citing *Valeriana Jatamansi* Jones and also *V. spica* Vahl.

However, as above mentioned, Jones' botanical description of *Valeriana Jatamansi* was wholly based on a species of *Valeriana* (*V. Wallichii* DC.) (cf. Hara, Fl. E. Himal. **2**: 128, 1971), although he considered it as the original plant of 'Jatamansi' by mistake. So the name *V. Jatamansi* cannot be adopted for 'Jatamansi'. Also both names *Patrinia Jatamansi* and *Nardostachys Jatamansi* based on *Valeriana Jatamansi* Jones cannot be used for true 'Jatamansi'.

The earliest correct name for 'Jatamansi' is *Nardostachys grandiflora* DC. (1830). The species is very variable in the size of flowers and also in the shape and size of leaves. The flowers vary from 1 cm to 2 cm in length. The leaves are generally oblanceolate, attaining 30 cm long and 4.5 cm wide, but sometimes linear-oblanceolate only 2 cm long and about 3 mm wide, and sometimes almost oblong 3 cm long and 1.5 cm wide, with 5 main nerves.

DIPSACACEAE (by Hiroshi Hara)

Morina longifolia Wall. [Cat. no. 426 (1829), nom. nud.] ex DC., Prodr. **4**: 644 (1830)–Wall., Pl. As. Rar. **3**: 1, t. 202 (1831)–Bot. Mag. t. 4092 (1844)–C.B. Clarke in Fl. Brit. Ind. **3**: 216 (1881).

Nepal. Langtang–Kyangjing, 3600 m (Jul. 13, 1970, fl.); Thale Bisauna–Tingoang, 3000 m (Sep. 11, 1970, fl.); Singum Gompa, 3000–3300 m (Aug. 22, 1972, no. 721825; Aug. 23, 1972, fl.).

Distr. Himalaya (Kashmir to Bhutan).

Morina nepalensis D. Don, Prodr. Fl. Nepal. 161 (1825)–C. B. Clarke in Fl. Brit. Ind. **3**: 217 (1881).

M. nana Wall. [Cat. no. 424 (1829), nom. nud.] ex DC., Prodr. **4**: 645 (1830).

M. betonicoides Benth. in Hook., Icon. Pl. **12**: 63, t. 1171 (1873)–Bot. Mag. t. 6966 (1887)–Pai in Fedde, Rep. **44**: 116 (1938)–Yamazaki in Fl. E. Himal. 321 (1966); **2**: 128 (1971).

Nepal. Langtang Gorge–Kyangjing, 2800–3600 m (Jul. 12 & 13, 1970, fl.); Hile Chok-Ghopte, 3500 m (Jun. 12, 1972, fl.); Bhanduke Pokhari–Saju Pokhari, 4200–4000 m (Jun. 15, 1972, fl.); Saju Pokhari-Pass, 4300 m (Jun. 16, 1972, fl.); Thudam–Lama Chungbu, 3400–4200 m (Jun. 23, 1972, fl.); Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972, fl.).

Darjeeling. Sandakphu, 3800–3900 m (Jul. 14, 15 & 20, 1969, fl.; Aug. 1, 1972); Mt. Singalila, 3900 m (Jul. 17, 1969, fl.).

Distr. Himalaya (Nepal to Bhutan), Assam, S. E. Tibet, N. Burma, and W. China.

Morina polyphylla Wall. [Cat. no. 425 (1829), nom. nud.] ex DC., Prodr. **4**: 644 (1830)–C. B. Clarke in Fl. Brit. Ind. **3**: 216 (1881).

Nepal. Mul Kharka–Oo Kharka, 3500 m (Jul. 7, 1970).

Bhutan. Cheka–Tremo La, 4000 m (Nishioka, Jun. 23, 1966).

Distr. Himalaya (Garhwal to Bhutan).

Triplostegia glandulifera Wall. [Cat. no. 436 (1829), nom. nud.] ex DC., Prodr. **4**: 642 (1830)–v. Steenis in Fl. Males. **4**: 291 (1951): Fl. E. Himal. 321 (1966).

NEPAL. Gyang-Thodang Danda, 2250-2470 m (Aug. 22, 1969, fl.); Thale Bisauna-Tingoang, 3000 m (Sep. 11, 1970, fl.); Sano Tingsang, 2900 m (Sep. 26, 1970, fl.); Chauke-Dor, 2800 m (Jul. 6, 1972, fl.); Khodang Danda-Latsu, 2500-2100 m (Aug. 29, 1972, fl. & fr.).

DARJEELING. Gairibas-Sandakphu, 2800-3600 m (Sep. 16, 1964, fl. & fr.; Jul. 31, 1972); Sandakphu-Phalut, 3300-3900 m (Jul. 16 & 19, 1969; Aug. 2, 1972, fl.); Mekma-Tonglu, 2600-3000 m (Jul. 30, 1972, fl.).

Distr. Himalaya (Garhwal to Bhutan), S. E. Tibet, N. Burma, W. & C. China, Formosa, and Malaysia (Celebes, New Guinea).

CAMPANULACEAE (by Hiroshi Hara)

Asyneuma fulgens (Wall.) Briquet in Candollea **4**: 334 (1931)-Damboldt in Boissiera **17**: 63 (1970).

Campanula fulgens Wall. in Roxb., Fl. Ind. ed. Carey, **2**: 99 (1824)-C. B. Clarke in Fl. Brit. Ind. **3**: 442 (1881).

NEPAL. Mane Gaon-Thale, 1240-2000 m (Jun. 24, 1970, fl.); Trisuli Khola-Singum Gompa, 2900 m (Aug. 22, 1972, fl.).

Distr. Himalaya (Nepal to Bhutan), Khasia, Manipur, S. India, S. Tibet, and W. & S. China.

Codonopsis dicentrifolia (C. B. Clarke) W.W. Smith in Rec. Bot. Surv. Ind. **4**: 388 (1913)-Anthony in Not. Bot. Gard. Edinb. **15**: 187 (1926).

Wahlenbergia? dicentrifolia C. B. Clarke in Fl. Brit. Ind. **3**: 430 (1881).

NEPAL. Lukthang-Kalingchok, 3400 m (Sep. 28, 1970, no. 674644, fl. violet purple & fr.).

Distr. E. Himalaya (Nepal, Sikkim).

Codonopsis javanica (Blume) Hook. f., Ill. Himal. Pl. 116, t. 16B (1855)-Moeliono et Tuyn in Fl. Males. **6**: 119, f. 7 (1960).

Campanumaea javanica Blume, Bijdr. 727 (1826)-Fl. Brit. Ind. **3**: 435 (1881).

DARJEELING. Batasi-Mani Bhanjyang, 2000 m (Aug. 9, 1972, fl. whitish with purple nerves).

Distr. E. Himalaya (Sikkim, Bhutan), Assam, S. India, Burma, Thailand, Indo-China, China, and Malaysia.

Codonopsis purpurea Wall. in Roxb., Fl. Ind. ed. Carey, **2**: 105 (1824)-Fl. Brit. Ind. **3**: 431 (1881)-Chipp in Journ. Linn. Soc. **38**: 390 (1908)-Anthony, l.c. 185 (1926).

NEPAL. Phulchoki, 2400 m (Aug. 9, 1969, fl.); Thale-Thale Bisauna, 2200 m (Sep. 10, 1970, fl.); Gram-Dunche, 1900-2000 m (Aug. 21, 1972, fl.); Trisuli Khola, 2000 m (Aug. 22, 1972, no. 723166, fl. dark purple).

Distr. Himalaya (Kumaon, Nepal), Khasia, and W. China.

Codonopsis thalictrifolia Wall. in Roxb., Fl. Ind. ed. Carey, **2**: 106 (1824)-Fl. Brit. Ind. **3**: 432 (1881)-Chipp, l.c. 381 (1908)-Anthony, l.c. 186 (1926)-Nannfeldt in Not. Bot. Gard. Edinb. **16**: 159 (1931).

Glosocomia tenera D. Don, Prodr. Fl. Nepal. 158 (1825), nom. superfl.

NEPAL. Lama Chungbu, 4200 m (Jun. 23, 1972, fl.); Singum Gompa-Gosainkund, 3200-4200 m (Aug. 23, 1972, fl.).

Distr. E. Himalaya (Nepal, Sikkim).

Cyananthus microphyllus Edgew. in Trans. Linn. Soc. **20**: 81 (1846)–Ballard in Bot. Mag. t. 9598 (1940)–Weibel in Candollea **17**: 85 (1960).

C. linifolius Wall. [Cat. no. 3722 (1831), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. **2**: 20 (1857)–Fl. Brit. Ind. **3**: 434 (1881).

C. nepalensis Kitamura in Act. Phytotax. Geobot. **15**: 109 (1954); in Kihara, Fauna Fl. Nepal Himal. 241, f. 67 (1955).

NEPAL. Lukthang–Kuri, 3400 m (Sep. 28, 1970, no. 674648, fl. blue).

Distr. Himalaya (Garhwal to Sikkim) and S. Tibet.

The species is variable, and our specimen has small narrow and often glabrescent leaves.

Cyananthus spathulifolius Nannfeldt in Act. Hort. Gothob. **5**: 30, f. 1 (1930) –Cowan in New Fl. & Silva **10**: 185 (1938).

NEPAL. Kipuphu, 4500 m (Jun. 27, 1972, no. 720800, fl. yellow); Topke Gola–Shewaden, 3100 m (Jun. 28, 1972, fl. yellow).

BHUTAN. Gyumbetang, 3800 m (Nishioka, Sep. 4, 1965).

Distr. E. Himalaya (Nepal to Bhutan) and W. China.

COMPOSITAE (by Siro Kitamura)

Ageratum conizoides L.: Kitamura in Fl. E. Himal. 330 (1966); **2**: 131 (1971).

NEPAL. Doban, 800 m (Jul. 2, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Ainsliaea latifolia (D. Don) Schultz-Bip.: Fl. E. Himal. 330 (1966); **2**: 132 (1971).

NEPAL. Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972).

Anaphalis Busua (Hamilt.) DC.: Fl. E. Himal. 331 (1966); **2**: 132 (1971), ut *A. Busua* (Ham.) Handel-Mazzetti.

NEPAL. Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972); Khodang Danda–Latsu, 2500–2400 m (Aug. 29, 1972).

Anaphalis contorta (D. Don) Hooker f.: Fl. E. Himal. 331 (1966); **2**: 132 (1971).

NEPAL. Gram–Dunche, 1900 m–2000 m (Aug. 21, 1972); Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972); Gosainkund 4000–4400 m (Aug. 24, 1972).

Anaphalis margaritacea (L.) Benth. et Hooker f.: Fl. E. Himal. 331 (1966); **2**: 132 (1971).

NEPAL. Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972); Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972).

DARJEELING. Palmajua–Batasi, 2200–2100 m (Aug. 8, 1972).

The leaves are linear-lanceolate, 7–10 cm long, 4–8 mm broad, and just like those of Japanese plants.

Anaphalis Royleana DC., Prodr. **6**: 272 (1837)–Kitamura in Act. Phytotax. Geobot. **23**: 10 (1968).

NEPAL. Thudam, 3400 m (Jun. 22, 1972, before flowering); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972).

Distr. Himalaya (Kunawar to Sikkim), Tibet, and Formosa.

Anaphalis triplinervis (Sims) C. B. Clarke: Fl. E. Himal. 332 (1966); **2**: 133 (1971).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972).

var. **intermedia** (DC.) Airy-Shaw: Fl. E. Himal. 332 (1966); **2**: 133 (1971).

Helichrysum stoloniferum D. Don, Prodr. Fl. Nepal. 176 (1825), non (L. f.) Willd. (1804).

Elichrysum nepalense Sprengel, Syst. **3**: 485 (1826).

Antennaria triplinervis β. cuneifolia DC., Prodr. **6**: 270 (1838).

Antennaria triplinervis γ. intermedia DC., l.c. 270 (1838).

Anaphalis mucronata β. polycephala DC., l.c. 272 (1838).

Anaphalis nubigena DC., l.c. 272 (1838)–Hook. f., Fl. Brit. Ind. **3**: 279 (1881), p.p.

Anaphalis nubigena var. *intermedia* Hook. f., l.c. 280 (1881).

Anaphalis cuneifolia (DC.) Hook. f., l.c. 280 (1881).

Anaphalis nepalensis (Sprengel) Hand.-Mzt., Symb. Sin. **7**: 1099 (1936)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 245 (1955); in Act. Phytotax. Geobot. **23**: 9 (1968).

NEPAL. Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972); Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972).

var. **monocephala** (DC.) Airy-Shaw in Bot. Mag. t. 9396 (1935).

Anaphalis monocephala DC., Prodr. **6**: 272 (1838).

A. mucronata DC., Prodr. **6**: 272 (1838), excl. var.–C. B. Clarke, Comp. Ind. 106 (1876).

A. nubigena var. *nubigena* proper: Hook. f., Fl. Brit. Ind. **3**: 280 (1881), p.p.

A. Nagasawae Hayata in Bot. Mag. Tokyo **20**: 15 (1906).

NEPAL. Hile Chok–Ghopte, 3500–3500 m (Jun. 12, 1972); Banduke Pokhari–Saju Pokhari, 4200–4000 m (Jun. 15, 1972); Lama Chungbu–Thudam, 4200–3400 m (Jun. 24, 1972); Samdan, 4400 m (Jun. 24, 1972); Kipuphu–Topke Gola, 4600–3600 m (Jun. 27, 1972); Gosainkund, 4000–4400 m (Aug. 24, 1972).

Distr. sp. Afghanistan (var. *intermedia*); and Himalaya, China, and Formosa (var. *monocephala*).

Anaphalis xylorhiza Schultz-Bipontinus ex Hook. f.: Fl. E. Himal. **2**: 133 (1971).

NEPAL. Lama Chungbu–Thudam, 4200–3400 m (Jun. 24, 1972).

Distr. Himalaya (Kumaon to Bhutan) and Tibet.

Artemisia japonica Thunberg: Fl. E. Himal. 333 (1966); **2**: 133 (1971).

A. parvifolia Roxb. ex D. Don, Prodr. Fl. Nepal. 181 (1825)–DC., Prodr. **6**: 100 (1838)–Fl. Brit. Ind. **3**: 322 (1881).

A. glabrata DC. in Wight, Contrib. 20 (1834); Prodr. **6**: 100 (1838).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972).

A. parvifolia Kitamura in Fauna and Flora of Nepal Himalaya is not *A. parvifolia* Roxb. ex D. Don, but *A. subdigittata* Mattf.

Artemisia Roxburghiana Besser in Bull. Soc. Nat. Moscow **9**: 57 (1836)–Fl. Brit. Ind. **3**: 326 (1881)–Kitamura in Act. Phytotax. Geobot. **23**: 12 (1968).

NEPAL. Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Gopte–Thale Patil, 3500–3400 m (Aug. 26, 1972).

Distr. Afghanistan, Karakoram, and Himalaya (Kashmir to Nepal).

Aster albescens (DC.) Hand.-Mzt.: Fl. E. Himal. 333 (1966); **2**: 133 (1971).

NEPAL. Dunche–Singum Gompa, 2000–3200 m (Aug. 22, 1972).

Stem 1 m high. Ligular florets pale violet.

Aster asteroides (DC.) O. Kuntze, Rev. Gen. 315 (1891)–Kitamura in Act. Phytotax. Geobot. **23**: 16 (1968).

Heterochaeta asteroides DC., Prodr. **5**: 282 (1836).

A. Heterochaeta Benth. in Benth. et Hook. f., Gen. Pl. **2**: 272 (1873).

NEPAL. Topke Gola, 3600 m (Jun. 19, 1972); Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972); Jalang Chhyongo–Thudam, 4200–3400 m (Jun. 21, 1972); Lama Chungbu–Thudam, 4200–3400 m (Jun. 24, 1972).

Roots tuberous. Stem densely glandular, 6–11 cm tall. Ligules uniseriate, intensely purple-blue (like the corolla of *Wisteria floribunda*). Tube pilose. Pappus double.

The type locality of this species is Kashmir.

Aster diplostephioides (DC.) C. B. Clarke, Comp. Ind. 45 (1876)–Kitamura in Act. Phytotax. Geobot. **23**: 16 (1968).

Heterochaeta diplostephioides DC., Prodr. **5**: 282 (1836).

NEPAL. Thudam–Lama Chungbu, 3700 m (Jun. 23, 1972).

Distr. Himalaya (Kashmir to Sikkim) and Tibet.

Aster flaccidus Bunge, Enum. Alt. 77 (1835)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 248 (1955).

DARJEELING. Phalut–Raman, 3600–2400 m (Aug. 4, 1972).

Distr. Pamir, Karakoram, Himalaya, Kuenlun, Tianshan, Altai, Mongolia, Siberia, and China.

Aster himalaicus C. B. Clarke, Comp. Ind. 43 (1876)–Fl. Brit. Ind. **3**: 250 (1881)–Onno in Bibl. Bot. **103**: 54 (1932)–Grierson in Not. Bot. Gard. Edinb. **26**: 122 (1965).

NEPAL. Gosainkund, 4000–4400 m (Aug. 24, 1972).

BHUTAN. Near Lingsh Dzong, 4100 m (Nishioka, Sep. 9, 1966).

Distr. Himalaya (Nepal, Sikkim, Bhutan), Assam, Burma, and Tibet.

The involucral scales of this species are broader (3.5–4 mm) than those of *A. tricephalus*.

Aster Stracheyi Hook. f., Fl. Brit. Ind. **3**: 250 (1881)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 249 (1955).

NEPAL. Topke Gola, 3600 m (Jun. 19, 1972); Kipuphu-Topke Gola, 4500–3600 m (Jun. 27, 1972).

Distr. Himalaya (Kumaon, Nepal).

Stroniferous plant. Roots numerous, robust and long, from the creeping rhizome. Ligules intensely purple blue. Pappus simple.

Aster tricephalus C.B. Clarke, Comp. Ind. 43 (1876)–Fl. Brit. Ind. **3**: 250 (1881)–Grierson in Not. Bot. Gard. Edinb. **26**: 117 (1965).

DARJEELING. Mane Bhanjyang–Tonglu, 2200–3150 m (Jul. 11, 1969); Sandakphu–Phalut, 3970–3930 m (Jul. 16 & 19, 1969); Tonglu–Sandakphu, 3000–3600 m (Jul. 31, 1972); Sandakphu–Phalut, 3600–3600 m (Aug. 2, 1972).

Distr. Himalaya.

Stem 50–60 cm tall, cauline leaves numerous, inferior ones withered at the flowering time, middle and superior ones overlapping each other, even to the base of the head. The involucral scales are narrow, 1.5 mm broad.

Bidens pilosa L. var. **minor** (Bl.) Sherff: Fl. E. Himal. **2**: 133 (1971).

NEPAL. Papung–Bir Gaon, 2000–1600 m (Jun. 30, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Brachyactis anomalum (DC.) Kitamura, comb. nov.

Erigeron anomalum DC., Prodr. **5**: 293 (1836).

B. menthodora Bentham in Hook., Icon. Pl. **12**: t. 1106 (1876)–Fl. Brit. Ind. **3**: 252 (1881)–Ling in Act. Phytotax. Sin. **11**: 429 (1973).

B. indica C. B. Clarke, Comp. Ind. 49 (1876).

NEPAL. Gopte–Thale Patil, 3500–3400 m (Aug. 26, 1972).

Distr. Himalaya (Kashmir to Sikkim) and S. Tibet.

This species belongs to *Erigeron* in the broad sense. The outer involucral scales are herbaceous and are longer than or as long as the inner ones. The tube florets are fewer (ca. 8) than the ligular florets. The ligule is longer than the filiform style branches.

Cacalia chenopodiifolia (DC.) Kitamura ex H. Koyama in Mem. Fac. Sci. Kyoto Univ. ser. Biol. 2, **2**: 170 (1969).

Senecio chenopodiifolius DC., Prodr. **6**: 364 (1838).

NEPAL. Gopte–Thale Patil, 3500–3400 m (Aug. 26, 1972).

Distr. Himalaya (Kashmir to Bhutan).

Cacalia Mortoni (C. B. Clarke) Kitamura ex H. Koyama, l.c. 166 (1969).

Senecio Mortoni C. B. Clarke, Comp. Ind. 208 (1876).

Ligularia Mortoni (C. B. Clarke) Hand.-Mzt. in London Journ. Bot. **76**: 289, in obs. (1838).

DARJEELING. Tonglu–Sandakphu, 3000–3600 m (Jul. 31, 1972); Sandakphu, 3600 m (Aug. 1, 1972).

Distr. E. Himalaya (Sikkim, Bhutan).

Cacalia pentaloba Hand.-Mzt. in Act. Hort. Gothob. **12**: 298 (1938)–H. Koyama, l.c. 172 (1969).

Prenanthes quinqueloba DC., Prodr. **7**: 195 (1838).

Senecio quinquelobus (DC.) Hooker f., Fl. Brit. Ind. **3**: 353 (1881).

C. quinqueloba (DC.) Kitamura in Kihara, Fauna Fl. Nepal Himal. 249 (1955), non Thunberg (1800).

NEPAL. Thudam–Kipuphu, 3400–4500 m (Jun. 26, 1972, before flowering).

DARJEELING. Sandakphu–Phalut, 3600–3000 m (Aug. 2, 1972, before flowering).

Distr. Himalaya (Garhwal to Bhutan).

Carpesium nepalense Lessing: Fl. E. Himal. 334 (1966); **2**: 134 (1971).

NEPAL. Phulchoki, 2200–2700 m (Jul. 15, 1972); Khodang Danda–Latsu, 2500–2400 m (Aug. 29, 1972).

DARJEELING. Raman–Rimbick, 2400–2200 m (Aug. 5, 1972).

Carpesium tracheliifolium Less.: Fl. E. Himal. 335 (1966).

NEPAL. Chitre, 2400 m (Jul. 8, 1972); Phulchoki, 1500–2200 m (Sep. 6, 1972).

DARJEELING. Tonglu–Sandakphu, 3000–3600 m (Jul. 31, 1972); Palmajua–Batasi, 2000–2100 m (Aug. 8, 1972).

Chrysanthellum indicum DC., Prodr. **5**: 631 (1836)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 250 (1955).

NEPAL. Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Distr. Tropical Africa, Madagascar, India, and Himalaya.

Cicerbita macrantha (C. B. Clarke) Beauverd: Fl. E. Himal. 336 (1966).

NEPAL. Gosainkund–Gopte, 4200–3500 m (Aug. 25, 1972); Gopte–Thale Patil, 3500–3400 m (Aug. 26, 1972); Mangen–Khodang Danda, 3100–2500 m (Aug. 28, 1972).

Distr. Himalaya (Nepal to Bhutan).

Root very thick, 5–10 cm long, 1.5 cm in diameter.

Cirsium argyracanthum DC.: Fl. E. Himal. 336 (1966); **2**: 135 (1971).

NEPAL. Hile–Chitre, 1900–2400 m (Jun. 5, 1972).

Cirsium phulchokiense Kitamura in Act. Phytotax. Geobot. **26**: 16 (1974).

NEPAL. Phulchoki, 1500 m (Sep. 6, 1972).

Distr. Himalaya (Nepal).

Cirsium verutum (D. Don) Sprengel: Kitamura in Fl. E. Himal. 336 (1966); **2**: 135 (1971); in Act. Phytotax. Geobot. **23**: 76 (1968).

Cirsium involucratum DC., Prodr. **6**: 639 (1838).

Cnicus verutus D. Don, Prodr. Fl. Nepal. 167 (1825).

DARJEELING. Tonglu–Sandakphu, 3000–3600 m (Jul. 31, 1972).

Cirsium Wallichii DC.: Fl. E. Himal. **2**: 135 (1971).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Conyza japonica Less.: Kitamura in Fl. E. Himal. 336 (1966); **2**: 135 (1971); in Act. Phytotax. Geobot. **23**: 76 (1968).

NEPAL. Hile–Mure, 2000 m (Jun. 5, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Conyza stricta Willdenow

var. **pinnatifida** (D. Don) Kitamura in Fl. E. Himal. 337 (1966).

NEPAL. Sim Chotala–Thale, 970–2200 m (Jun. 2, 1969); Papung–Bir Gaon, 2000–1600 m (Jun. 30, 1972).

Cremanthodium Decaisnei C. B. Clarke, Comp. Ind. 168 (1876)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 251 (1955).

NEPAL. Jalang Chhyongo–Thudam, 4200–3400 m (Jun. 21, 1972); Kipuphu–Phujeng La, 4700 m (Jun. 27, 1972).

Distr. sp. Himalaya (Kashmir to Bhutan), Tibet, and China.

Cremanthodium oblongatum C. B. Clarke, Comp. Ind. 168 (1876).

C. Nakaoi Kitamura in Act. Phytotax. Geobot. **15**: 105 (1954).

NEPAL. Thudam–Lama Chungbu, 3400–4200 m (Jun. 23, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Gosainkund, 4000–4400 m (Aug. 24, 1972).

Distr. Himalaya (Nepal, Sikkim), Tibet, and W. China.

Leaves oblong penninerved.

Cremanthodium reniforme Benth.: Fl. E. Himal. 337 (1966).

NEPAL. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Gosainkund–Gopte, 4200–3500 m (Aug. 25, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972).

Cremanthodium retusum (DC.) Good in Journ. Linn. Soc. **48**: 278 (1929).

Ligularia retusa DC., Prodr. **6**: 314 (1838).

Senecio retusus Wall. ex Hook. f., Fl. Brit. Ind. **3**: 350 (1881).

Ligularia nigro-pilosa Kitamura in Act. Phytotax. Geobot. **15**: 107 (1954).

NEPAL. Gosainkund–Gopte, 4200–3500 m (Aug. 25, 1972).

DARJEELING. Phalut-Singalila, 3600–3700 m (Jul. 17, 1969, before flowering; Aug. 3, 1972); Phalut, 3600 m (Jul. 18, 1969, before flowering).

Distr. Himalaya (Nepal, Sikkim, Bhutan), Assam, Tibet, and W. China (Yunnan).

A very variable species. The stem densely nigro-pilose above, not slightly araneose as in the description of Good. Cauline leaves several (4–5), reniform, pubescent or glabrous beneath. Head solitary or racemose, smaller than that of *C. reniforme*. Involucre 8–15 mm long. Pappus white or darty brown.

Dichrocephala Benthamii C. B. Clarke: Fl. E. Himal. 337 (1966); **2**: 136 (1971).

NEPAL. Hile–Mure, 200 m (Jun. 5, 1972).

Dichrocephala integrifolia (L. f.) O. Kuntze: Fl. E. Himal. 338 (1966); **2**: 136 (1971).

DARJEELING. Raman–Rimbick, 2400–2200 m (Aug. 5, 1972).

Dubyaea hispida DC.: Kitamura in Fl. E. Himal. 338 (1966); in Act. Phytotax. Geobot. **23**: 130 (1969).

Crepis bhotanica Hutchinson in Kew Bull. **1916**: 189 (1916).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972); Sandakphu–Phalut, 3600 m (Aug. 2, 1972).

Eclipta prostrata (L.) L.: Fl. E. Himal. 338 (1966); **2**: 136 (1971).

NEPAL. Mohamabedi Khola, 400 m (Jul. 9, 1972).

Erigeron bellidioides (D. Don) Bentham in Bentham et Hook. f., Gen. Pl. **2**: 280 (1873)–C. B. Clarke, Comp. Ind. 55 (1876)–Fl. Brit. Ind. **3**: 256 (1881).

Aster bellidioides D. Don, Prodr. Fl. Nepal. 177 (1825)–Wallich, Pl. As. Rar. **2**: 1, t.101 (1831).

Stenactis bellidioides Nees, Aster 274 (1832)–DC., Prodr. **5**: 299 (1836).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

DARJEELING. Tonglu–Sandakphu, 3970 m (Jul. 13, 1969); Sandakphu–Phalut, 3970–3930 m (Jul. 16, 1969).

BHUTAN. Tongsa–Uto La Road, 2200–2950 m (Apr. 17, 1967); Tzatogang–Dotanang, 3200–2700 m (May 27, 1967); Dotanang-Thimphu, 2700–2450 m (May 28, 1967).

Distr. Himalaya.

Erigeron canadensis L.: Fl. E. Himal. 338 (1966); **2**: 136 (1971).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

SIKKIM. Gangtok–Temi, 900–1620 m (Jun. 28, 1969).

Erigeron multiradiatus (Lindley) Benth. in Bentham et Hook. f., Gen. Pl. **2**: 280 (1873)–Hook. f., Fl. Brit. Ind. **3**: 256 (1881)–Ling in Act. Phytotax. Sin. **11**: 410 (1973).

Aster inuloides D. Don, Prodr. Fl. Nepal. 178 (1825), non *Erigeron inuloides* Poiret, Encycl. Suppl. **5**: 464 (1817).

Stenactis multiradiata Lindley ex DC., Prodr. **5**: 299 (1836).

NEPAL. Lama Chungbu–Thudam, 4200–3400 m (Jun. 24, 1972).

Distr. Himalaya.

Erigeron sumatrensis Retz.: Fl. E. Himal. 338 (1966); **2**: 137 (1971).

NEPAL. Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Erigeron uniflorus L., Sp. Pl. ed. 1, 864 (1753)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 259 (1955).

Heterochaeta erigeroides DC., Prodr. **5**: 282 (1836).

E. acris var. *erigeroides* (DC.) C. B. Clarke, Comp. Ind. 54 (1876).

E. alpinus L. var. *uniflora* Hook. f., Fl. Brit. Ind. **3**: 256 (1881).

NEPAL. Above Dunche–Gosainkund, 2065–3000 m (Jun. 4, 1969).

Distr. Europe, Caucasia, Afghanistan, Himalaya, Siberia, and North America.

Gnaphalium affine D. Don: Fl. E. Himal. 339 (1966).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972); Hile–Chitre, 1900–2400 m (Jun. 5, 1972); Chitre–Dor, 2400–2600 m (Jun. 6, 1972); Chauke–Dor, 2700–2600 m (Jul. 6, 1972).

Jurinea Dolomiaea Boiss., Fl. Orient. Suppl. 311, in obs. (1888).

Dolomiaea macrocephala DC. in Guill., Arch. Bot. **2**: 330 (1833); Prodr. **6**: 542 (1838)–Royle, Ill. Bot. Himal. **2**: pl. 57 (1839)–Ling in Act. Phytotax. Sin. **10**: 87 (1965).

J. macrocephala (DC.) Bentham in Bentham et Hook. f., Gen. Pl. **2**: 474 (1873), non DC. (1837)–C. B. Clarke, Comp. Ind. 237 (1876)–Hook. f., Fl. Brit. Ind. **3**: 378 (1881).

NEPAL. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Distr. Himalaya (Kashmir to Nepal).

Heads 4 cm long including florets. Involucre 3.5 cm long when dried, outer involucral scales lanceolate or ovato-lanceolate, inner oblong-lanceolate, setulose in the upper part. Corolla 27–30 mm long, narrow part of tube 17–20 mm long. Pappus 25 mm long, upper part darty purple brown, lower part brown, bristles numerous barbellate, attenuate at the apex.

A very remarkable species with numerous radical leaves and very short stem. The style branches and the corollas are just like those of the typical *Jurinea*, respectively.

Lactuca Lessertiana (DC.) C. B. Clarke, Comp. Ind. 270 (1876)–Kitamura in Act. Phytotax. Geobot. **23**: 142 (1969).

Mulgedium? Lessertiana DC., Prodr. **7**: 251 (1838).

Melanoseris lyrata Decaisne in Jacquemont, Voy. **4** (Bot.): 101, t. 109 (1844).

NEPAL. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Gosainkund, 4400 m (Aug. 24, 1972).

Distr. Himalaya (Kashmir to Bhutan).

Leibnitzia nepalensis (Kunze) Kitamura: Fl. E. Himal. 341 (1966); **2**: 138 (1971).

DARJEELING. Sandakphu–Tonglu, 3600–3100 m (Jul. 21, 1969).

Ligularia amplexicaulis DC., Prodr. **6**: 314 (1838).

NEPAL. Gosainkund–Gopte, 4200–3500 m (Aug. 25, 1972).

Distr. Himalaya (Kashmir to Bhutan).

Ligularia corymbosa DC., Prodr. **6**: 314 (1838)-C. B. Clarke, Comp. Ind. 205 (1876).

DARJEELING. Sandakphu, 3600 m (Jul. 20, 1969; Aug. 1, 1972).

BHUTAN. Ha La-Kyu La, 3400 m (S. Nakao, Aug. 8, 1958, no. 726 KYO).

Distr. Himalaya (Kashmir to Bhutan).

Ligularia Fischerii (Ledeb.) Turcz., Cat. Fl. Baic. Dahur. n. 644 (1837).

Cineraria Fischerii Ledeb., Index Sem. Hort. Dorp. 17 (1820).

L. racemosa DC., Prodr. **6**: 314 (1838).

L. sibirica var. *racemosa* (DC.) Kitamura in Kihara, Fauna Fl. Nepal Himal. 266 (1955).

NEPAL. Phulchoki, 2000–2700 m (Jul. 15, 1972).

Distr. Himalaya, China, Korea, Japan, East Siberia, and Saghalien.

Myriactis nepalensis Less.: Fl. E. Himal. 342 (1966); **2**: 139 (1971).

NEPAL. Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Khodang Danda–Latsu, 2500–2400 m (Aug. 29, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972); Sandakphu–Phalut, 3600 m (Aug. 2, 1972).

Picris hieracioides L.

subsp. **kaimaensis** Kitamura: Fl. E. Himal. 342 (1966); **2**: 139 (1971).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Saussurea auriculata (DC.) Sch.-Bip.: Fl. E. Himal. **2**: 139 (1971).

DARJEELING. Phalut–Singalila, 3600–3700 m (Aug. 3, 1972); Phalut–Raman, 3600–2400 m (Aug. 4, 1972).

Saussurea leontodontoides (DC.) Handel-Mazzetti, Symb. Sin. **7**: 1155 (1936).

Aplotaxis leontodontoides DC., Prodr. **6**: 539 (1838).

S. Kunthiana C. B. Clarke, Comp. Ind. 225 (1876)-Hook. f., Fl. Brit. Ind. **3**: 369 (1881).

NEPAL. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Distr. Himalaya (Kashmir to Sikkim) and W. Tibet.

Saussurea nepalensis Sprengel, Syst. Veg. **3**: 380 (1826)-Kitamura in Act. Phytotax. Geobot. **24**: 6 (1969).

S. eriostemon Wall. ex C. B. Clarke, Comp. Ind. 229 (1876).

NEPAL. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Distr. Himalaya (Nepal, Bhutan) and Tibet.

Head 3 cm in diameter. Outer puppus bristles coroniform. Achenes smooth.

Saussurea uniflora Wall. ex Hook. f., Fl. Brit. Ind. **3**: 366 (1881).

NEPAL. Gosainkund, 4000–4400 m (Aug. 24, 1972).

Distr. Nepal and Sikkim.

Saussurea Yakla C. B. Clarke, Comp. Ind. 227 (1876)-Kitamura in Act. Phytotax. Geobot. **24**: 9 (1969).

NEPAL. Gosainkund–Gopte, 4200–3500 m (Aug. 25, 1972).

Distr. Himalaya (Nepal, Sikkim, Bhutan).

This species is distinct by the muricate achenes. Outer puppus bristles form a corona.

Senecio alatus Wall. ex DC.: Fl. E. Himal. 343 (1966).

Nepal. Gopte–Thale Patil, 3500–3400 m (Aug. 26, 1972).

Senecio chrysanthemoides DC.: Fl. E. Himal. 343 (1966); **2**: 140 (1971).

Nepal. Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972); Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972).

Darjeeling. Sandakphu, 3600 m (Jul. 31, 1972).

Sonchus arvensis L.: Fl. E. Himal. 345 (1966); **2**: 140 (1971).

Nepal. Phulchoki, 2000–2700 m (Jul. 15, 1972).

Soroseris pumila Stebbins in Mem. Torrey Bot. Club. **19**: 38 (1940)–Kitamura in Act. Phytotax. Geobot. **24**: 10 (1969).

Nepal. Gosainkund, 4000–4400 m (Aug. 24, 1972).

Distr. Himalaya (Nepal, Sikkim) and Tibet.

Tridax procumbens L.: Fl. E. Himal. 346 (1966); **2**: 141 (1971).

Nepal. Tamur Bridge, 300 m (Jul. 9, 1972).

Wedelia Wallichii Less.: Fl. E. Himal. **2**: 142 (1971).

Nepal. Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Darjeeling. Tonglu, 3100 m (Jul. 22, 1969); Batasi–Mani Bhanjyang, 2100–2000 m (Aug. 9, 1972).

MONOCOTYLEDONEAE

NAJADACEAE (by Hiroo Kanai)

Najas minor All., Fl. Pedem. **2**: 221 (1785)–Hook. f., Fl. Brit. Ind. **6**: 569 (1893).

NEPAL. Satmuhne–Pokhara, 600 m (Jan. 15, 1970).

Distr. Old World.

HYDROCHARITACEAE (by Hiroshi Hara)

Blyxa echinosperma (C. B. Clarke) Hook. f., Fl. Brit. Ind. **5**: 661 (1888)–den Hartog in Fl. Males. **5**: 391, f. 6a (1957), excl. syn. *B. lancifolia* Hook. f.

Hydrotrophus echinospermus C. B. Clarke in Journ. Linn. Soc. **14**: 8, t. 1 (1873).

B. ceratosperma Maxim. ex Aschers. et Gürke in Engl., Pfl.-fam. II, **2** (1): 253 (1889)–Nakai in Journ. Jap. Bot. **19**: 248, f. 1b (1943)–Ohwi, Fl. Jap. ed. Engl. 129 (1965).

B. bicaudata Nakai, l.c. 249, f. 1a (1943).

NEPAL. Pokhara, 900 m (Jun. 18, 1967, no. 672774, fr.).

Distr. Nepal, India, Ceylon, Burma, Indo-China, China, Japan, Malaysia, and Australia.

Our specimen has shorter seeds 3 mm in length including the tails at both ends, and corresponds to *Blyxa ceratosperma* Maxim. of Japan, while typical *B. echinosperma* has seeds 8–10 mm long including the long tails.

GRAMINEAE (by Jisaburo Ohwi)

Anthoxanthum sikkimense (Maxim.) Ohwi in Bull. Sci. Mus. Tokyo **18**: 8 (1947)–Bor, Grass. Ind. 431 (1960).

Hierochloe sikkimense Maxim. in Bull. Acad. Sci. St. Pétersb. **32**: 626 (1888).

H. gracillima Hook. f., Fl. Brit. Ind. **7**: 223 (1896).

A. gracillimum (Hook. f.) Mez in Fedde, Rep. **17**: 291 (1921).

NEPAL. Kyangjing, Langtang Khola, 3800 m (Jul. 15, 1970, no. 672587).

Distr. E. Himalaya (Nepal and Sikkim).

Arundinella Hookeri Munro ex Keng in Nat. Centr. Univ. Sci. Rep., ser. B, **2** (3): 50 (1936).

A. villosa Arn. ex Steud. var. *himalaica* Hook. f., Fl. Brit. Ind. **7**: 73 (1896).

NEPAL. Kyangjing–Langtang, 3400–3800 m (Jul. 16, 1970).

Distr. Himalaya (Nepal to Bhutan), Tibet, and N. Burma.

Brachiaria ramosa (L.) Stapf: Hsu in Fl. E. Himal. 353 (1966).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972); Doban, 800 m (Jul. 2, 1972); Sim Chotala–Ramche, 1000 m (Aug. 20, 1972).

Brachiaria villosa (Lam.) A. Camus: Fl. E. Himal. 354 (1966).

NEPAL. Sim Chotala, 900 m (Aug. 20, 1972).

Brachypodium sylvaticum (Huds.) P. Beauv.: Fl. E. Himal. 354 (1966).

Darjeeling. Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

Chrysopogon aciculatus (Retz.) Trin.: Fl. E. Himal. 355 (1966); Ohwi in Fl. E. Himal. **2**: 144 (1971).

Nepal. Barabise–Thale, 850–2050 m (Sep. 9, 1970).

Danthonia Jacquemontii Bor in Kew Bull. **1952**: 80 (1952).

var. **minor** (Hook. f.) Bor in Kew Bull. **1952**: 81 (1952); Grass. Ind. 479 (1960).

D. cachemyriana Hook. f. var. *minor* Hook. f., Fl. Brit. Ind. **7**: 282 (1896).

D. Cumminsii Hook. f., l.c. 282 (1896).

Nepal. Tingoang–Khosori Khabre, 3000 m (Sep. 12, 1970, no. 672848B).

Deschampsia caespitosa (L.) P. Beauv., Ess. Agrost. 91, 160 (1812)–Hook. f., Fl. Brit. Ind. **7**: 273 (1896)–Bor, Grass. Ind. 435 (1960).

Aira caespitosa L., Sp. Pl. ed. 1, 64 (1753).

Agrostis caespitosa (L.) Salisb., Prodr. Stirp. 25 (1796).

Nepal. Thudam–Kipudonsu, 3600 m (Jun. 26, 1972).

Distr. Temperate to arctic regions in Northern Hemisphere and Africa.

Digitaria adscendens (HBK) Henr.: Fl. E. Himal. 358 (1966).

Nepal. Doban, 800 m (Jul. 2, 1972); Sim Chotala, 900 m (Aug. 20, 1972).

Digitaria cruciata (Nees) A. Camus: Fl. E. Himal. 358 (1966).

Nepal. Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Digitaria longiflora (Retz.) Pers.: Fl. E. Himal. 358 (1966).

Nepal. Sim Chotala, 900 m (Aug. 20, 1972).

Digitaria microbachne (Presl) Henr.: Fl. E. Himal. 359 (1966).

Nepal. Sanguri Bhanjyang–Dharan, 800 m (Jul. 10, 1972).

Duthiea nepalensis Bor in Kew Bull. **1953**: 550 (1954); Grass. Ind. 436 (1960).

Nepal. Kyangjing, Langtang Khola, 3800 m (Jul. 15, 1970, no. 672591).

Distr. Himalaya (Nepal).

Echinochloa colonum (L.) Link: Fl. E. Himal. 360 (1966).

Nepal. Doban, 800 m (Jul. 2, 1972); Sim Chotala–Gram, 900 m (Aug. 20, 1972).

Eleusine indica (L.) Gaertn.: Fl. E. Himal. 360 (1966).

Nepal. Dhara Pani–Sanguri Bhanjyang, 1100 m (Jul. 10, 1972).

Eragrostis atrovirens (Desf.) Trin. ex Steud.: Fl. E. Himal. 361 (1966).

Nepal. Teku Nala–Hile, 800–1900 m (Jun. 4, 1972).

Eragrostis unioloides (Retz.) Nees ex Steud.: Fl. E. Himal. 363 (1966).

Nepal. Nijgar–Patlaia, 100 m (Nov. 15, 1970).

Eragrostis viscosa (Retz.) Trin. in Mém. Acad. Sci. St. Pétersb. sér. 6, **1**: 397 (1830).

Poa viscosa Retz., Obs. Bot. **4**: 20 (1786).

E. tenella var. *viscosa* (Retz.) Stapf in Fl. Brit. Ind. **7**: 315 (1896).

Nepal. Doban, 800 m (Jul. 2, 1972).

Distr. Himalaya, India, and Africa.

Eulalia mollis (Griseb.) O. Kuntze: Fl. E. Himal. 364 (1966).

Nepal. Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

Festuca gigantea (L.) Vill., Hist. Pl. Dauph. **2**: 110 (1787)–Stapf in Fl. Brit. Ind. **7**: 353 (1896)–Bor, Grass. Ind. 538 (1960).

Nepal. Gram, 1900 m (Aug. 21, 1972).

Distr. Temperate Asia, introduced into N. America.

Festuca leptopogon Stapf: Fl. E. Himal. 364 (1966); **2**: 144 (1971).

NEPAL. Tinjure Phedi–Tinjure, 2800 m (Jul. 6, 1972).

Festuca ovina L., Sp. Pl. ed. 1, 73 (1753)–Bor, Grass. Ind. 539 (1960).

F. valesiaca Schleich. ex Gaud., Agrost. Helvet. **1**: 242 (1811)–Stapf in Fl. Brit. Ind. **7**: 348 (1896).

NEPAL. Oo Kharka–Mul Kharka, 3800 m (Jul. 1, 1970); Hile Chok, 3800 m (Jun. 12, 1972).

Distr. Temperate regions of the world.

Festuca polycolea Stapf: Fl. E. Himal. 364 (1966).

NEPAL. Gosainkund, 4400 m (Aug. 24, 1972).

Helictotrichon virescens (Nees ex Steud.) Henr.: Fl. E. Himal. 364 (1966).

NEPAL. Gopte–Thale Patil, 3400–3500 m (Aug. 26, 1972).

Imperata cylindrica (L.) P. Beauv. var. **major** (Nees) C. E. Hubb. ex Hubb. et Vaughan: Fl. E. Himal. 366 (1966); **2**: 144 (1971).

NEPAL. Nigale–Kuwa Pani, 1800 m (Jun. 4, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Isachne albens Trin.: Fl. E. Himal. 366 (1966).

DARJEELING. Batasi (Aug. 9, 1972).

Neyraudia arundinacea (L.) Henr. in Meded. Herb. Leid. no. 58, 8 (1929), in obs.–Bor, Grass. Ind. 518 (1960).

Aristida arundinacea L., Mant. Pl. Alt. 186 (1771).

Arundo madagascariensis Kunth, Rev. Gram. **1**: 273, t. 48 (1830).

N. madagascariensis (Kunth) Hook. f., Fl. Brit. Ind. **7**: 305 (1896), p.p., excl. var. *Zollingeri*.

NEPAL. Makwampur Garhi–Siwanta, 700–1200 m (Apr. 21-22, 1969); Kagne–Samari Bhanjyang, 950 m (Jan. 7, 1970).

Distr. Tropical Africa, Mascarenes, and Himalaya (Kumaon to Nepal).

Oryza minuta J. S. Presl ex C. B. Presl, Rel. Haenk. **1**: 208 (1830)–Bor, Grass. Ind. 605 (1960).

O. officinalis Wall. [Cat. no. 8635 (1848), nom. nud.] ex Watt, Dict. Econ. Prod. Ind. **5**: 501 (1891).

O. latifolia Hook. f., Fl. Brit. Ind. **7**: 92 (1896), non Desv. (1813).

NEPAL. Nijgar–Patlaia, 100 m (Nov. 15, 1970, no. 674970).

Distr. Himalaya (Nepal, Sikkim), Assam, Burma, and Malaysia.

Panicum psilopodium Trin.: Fl. E. Himal. 370 (1966).

NEPAL. Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Poa annua L.: Fl. E. Himal. 372 (1966); **2**: 145 (1971).

NEPAL. Tute–Dor, 2600 m (Jun. 6, 1972).

Poa khasiana Stapf: Fl. E. Himal. 373 (1966).

NEPAL. Kokim Pokhari–Hati Surde, 2900 m (Jun. 11, 1972).

Poa pagophila Bor: Fl. E. Himal. 373 (1966).

NEPAL. Janga La–Thudam, 3600 m (Jun. 21, 1972); Slesa–Lama Chungbu, 4300 m (Jun. 24, 1972); Phujeng La–Topke Gola, 4000 m (Jun. 27, 1972).

Pogonatherum paniceum (Lam.) Hack.: Fl. E. Himal. 373 (1966).

NEPAL. Dhankuta, 1300 m (Jun. 4, 1972).

Saccharum spontaneum L: Fl. E. Himal. 374 (1966).

NEPAL. Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972).

Setaria palmifolia (Koen.) Stapf: Fl. E. Himal. 376 (1966).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

DARJEELING. Batasi, 2100 m (Aug. 9, 1972).

CYPERACEAE (by Tetsuo Koyama)

Bulbostylis barbata (Rottboell) C. B. Clarke: T. Koyama in Fl. E. Himal. 380 (1966).

NEPAL. Dhara Pani–Sanguri Bhanjyang, 1000 m (Jul. 10, 1972).

Bulbostylis densa (Wallich ex Roxb.) Hand.-Mzt. ex Karsten et Schenk: Fl. E. Himal. 380 (1966).

NEPAL. Bhorlang–Pati Bhanjyang, 2100–2200 m (Aug. 21, 1969); Tsendang Pokhari, 3000 m (Aug. 23, 1969); Dakchin Kali, 1500 m (Aug. 31, 1969); Thale–Thale Bisauna, 2200 m (Sep. 10, 1970).

Distr. India, Himalaya, Ceylon, China, and Japan.

Carex atrata L. subsp. **pullata** (Boott) Kükenthal in Engl., Pfl.-reich. IV–20, Ht. **38**: 400 (1909).

C. atrata L. var. *pullata* Boott, Ill. Carex **3**: 114, t. 364 (1862).

C. Duthiei C. B. Clarke in Hook. f., Fl. Brit. Ind. **6**: 731 (1894): Fl. E. Himal. 381 (1966).

NEPAL. Mul Kharka–Chilime Khola, 4000 m (Jul. 4, 1970); Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Lama Chungbu–Slesa, 4200–4500 m (Jun. 24, 1972); Thudam, 3400 m (Jun. 25, 1972).

Distr. India, Himalaya, and C. & S. W. China.

Subspecies *pullata* differs from subsp. *atrata* primarily in the taller habit and in the culms that are scabrous in the upperpart toward the inflorescence. The narrowly ovate utricles of subsp. *pullata* tend to be slightly more elongated than the ovate to ovate-oval ones in subsp. *atrata*. These characters, however, do not permit a clearcut separation due to the presence of the plants of intermediate status. In the collection from East Nepal (Jun. 24, 1972), for instance, culms are not scabrous at all, but the utricles are narrowly ovate with a rather gradually produced beak.

Carex atrofusca Schkuhr subsp. **minor** (Boott) T. Koyama, stat. nov.

C. ustulata Wahlenberg var. *minor* Boott, Ill. Carex **1**: 71, t. 194, f. 1 (1858).

C. atrofusca Schkuhr var. *angustifructus* et var. *minor* (Boott) Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 554 (1909)–Ohwi et T. Koyama in Kihara, Fauna Fl. Nepal Himal. 86 (1955).

C. ustulata Wahlenberg sensu C. B. Clarke in Fl. Brit. Ind. **6**: 734 (1894).

C. atrofusca Schkuhr sensu Ohwi in Fl. E. Himal. **2**: 146 (1971).

NEPAL. Lama Chungbu–Slesa, 4500 m (Jun. 24, 1972).

Distr. Pamir, Himalaya (Nepal, Sikkim), and E. Tibet.

Subspecies *minor* differs from European subsp. *atrofusca* in the more conspicuously creeping rhizomes. The differences in utricles as claimed by Kükenthal are valid. Determination as to whether or not the Asian subspecies involves more than two entities still awaites further investigation.

Carex cruenta Nees in Wight, Contrib. Bot. Ind. 128 (1834)–C. B. Clarke in Fl. Brit. Ind. **6**: 734 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 555, f. 91 E, F (1909).

NEPAL. Banduke Pokhari–Saju Pokhari, 4000 m (Jun. 15, 1972).

Distr. Endemic to Himalaya, from Kashmir to Sikkim and to Tibet.

Carex decora Boott: Fl. E. Himal. 381 (1966); **2**: 146 (1971).

NEPAL. Phulchoki–Kathmandu (Nov. 3, 1970); Gram–Thale, 1900 m (Aug. 21, 1972).

Carex diluta M. v. Bieberstein, Fl. Taur. Caucas. **2**: 388 (1808); **3**: 614 (1819)–C. B. Clarke in Fl. Brit. Ind. **6**: 737 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 659 (1909).

NEPAL. Kyangjing–Langtang Khola, 3600–3900 m (Jul. 15, 1970).

Distr. S. Europe, Mediterranean Region, W. & C. Asia, Pakistan, and Himalaya (Nepal).

This species has apparently not previously been documented from Nepal. I have seen another collection, Stainton, Sykes & Williams 760 (BM), from Central Nepal. These collections mark a range extension of Central Asian elements into central Nepal.

Carex filicina Nees: Fl. E. Himal. 381 (1966); **2**: 147 (1971).

NEPAL. Chipu Danda, 2100 m (Aug. 20, 1969); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Distr. Eastern India to Malaysia, extending also from the Himalayas through south-central Chinese Continent to Formosa. Common as undergrowth of forests throughout the range with wide variation.

Carex finitima Boott: Fl. E. Himal. 382 (1966); **2**: 147 (1971).

NEPAL. Mul Kharka–Oo Kharka, 3720 m (Jul. 7, 1970).

Distr. Nepal, Sikkim, Malaysia and assumingly in S. China.

The collection cited above falls under the criterion of var. *attenuata* of Kükenthal in its smaller habit with leaves and bracts which are much shorter than the culms. I have not been convinced, however, if this variety can be held as valid; it may only reflect an ecological condition.

Carex foliosa D. Don: Fl. E. Himal. **2**: 147 (1971).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972).

Distr. Himalaya (Kashmir to Sikkim) and India (Nilghiri).

Carex hebecarpa C. A. Meyer subsp. **ligulata** (Nees) T. Koyama, stat. nov.

C. ligulata Nees in Wight, Contrib. Bot. Ind. 127 (1834)–Boott, Ill. Carex **1**: 45, t. 113 (1858)–C. B. Clarke in Fl. Brit. Ind. **6**: 747 (1894).

C. hebecarpa C. A. Meyer var. *ligulata* (Nees) Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 745 (1909).

NEPAL. Phulchoki (Nov. 3, 1970).

Distr. Himalaya, India, Ceylon, China, and Japan.

The differences between *C. hebecarpa* and *C. ligulata* are minute. The latter is separable from the former only in the narrower leaf blades, which are 6 to 11 mm vs. 1.5–5 mm. When the Japanese plants are compared with *C. hebecarpa* from India, the utricles tend to be longer for 1 to 1.5 mm, but this difference was not seen in Ceylonese and Indian plants. The broad-leaved *C. ligulata* is no more than a subspecific taxon under *C. hebecarpa*.

Carex hirtella Drejer, Symbol. Caricol. 21 (1844)–C. B. Clarke in Fl. Brit. Ind. **6**: 744 (1894)–Kükenthal in Pfl. -reich. IV–20, Ht. **38**: 561, f. 92 (1909).

NEPAL. Langtang–Kyangjing, 3500 m (Jul. 13, 1970).

Distr. Afghanistan and Himalaya.

Carex inanis Kunth: Fl. E. Himal. **2**: 147 (1971).

C. Schlagintweitiana Böcklr., Cyper. Nov. **1**: 48 (1888)–C. B. Clarke in Fl. Brit. Ind. **6**: 743 (1894)–Ohwi et T. Koyama in Kihara, Fauna Fl. Nepal Himal. 90 (1955).

C. setigera D. Don var. *Schlagintweitiana* (Böcklr.) Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 419 (1909).

NEPAL. Khanging–Langtang Gorge, 2600–2800 m (Jul. 11, 1970); Gupha Pokhari, 2800 m (Jun. 10, 1972); Thudam, 3400 m (Jun. 25, 1972); Tute–Chitre, 2300–2400 m (Jul. 7, 1972).

Distr. Asian highlands from C. Asia through Kashmir to Sikkim.

Carex inanis differs from closely related *C. setigera* in the awnless glumes and less inflated utricles as well as in its relatively slenderer habit. Generally *C. inanis* has rhizomes, which are not quite stoloniferous like those of *C. setigera*, but this character is not always quite clear as the underground parts of *C. inanis* at times creep short. Examination of the type of *C. Schlagintweitiana* has shown that it is identical with *C. inanis*.

Carex inclinis Boott ex C. B. Clarke: Fl. E. Himal. **2**: 147 (1971).

C. setigera D. Don var. *inclinis* Boott ex C. B. Clarke in Fl. Brit. Ind. **6**: 728 (1894), pro syn.

NEPAL. Yatumbal–Chilime, 2700 m (Jul. 8, 1970).

Distr. E. Himalaya (C. Nepal to Sikkim).

Carex incurva Lightfoot, Fl. Scot. **2**: 544, t. 24, f. 1 (1777)–C. B. Clarke in Fl. Brit. Ind. **6**: 700 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 113, f. 22 A–C (1909).

NEPAL. Slesa–Lama Chungbu, 4300 m (Jun. 24, 1972).

Distr. Arctic Eurasia and North America; also alpine regions of Europe, Central Asia, and perhaps antarctic South America.

Carex infuscata Nees in Wight, Contrib. Bot. Ind. 125 (1834).

C. alpina Swartz var. *infuscata* (Nees) Boott, Ill. Carex **3**: 113 (1862).

C. tricuspidata Böckeler, Cyper. Nov. **1**: 45 (1888).

C. alpina Swartz subsp. *infuscata* (Nees) Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 386 (1909).

NEPAL. Gupha Pokhari, 2800 m (Jun. 10, 1972).

Distr. Afghanistan and Himalaya (Kashmir and Sikkim).

Asian *C. infuscata* can be segregated from European *C. alpina* in the conspicuously racemose inflorescences and in the ovate-acute pistillate glumes, which always surpass the subtending utricle. In these characters I have not seen so far any intermediate phases. Nevertheless these two species are so closely resembling, Kükenthal might be correct after all in interpreting *C. infuscata* as a subspecies of

C. alpina.

Carex laeta Boott, Ill. Carex **1**: 69, t. 188 (1858)–C. B. Clarke in Fl. Brit. Ind. **6**: 745 (1894)–Kükenthal in Pfl-reich. IV–20, Ht. **38**: 490 (1909).

C. laeta Boott var. *major* Boott, l.c. 69 (1858).

C. pisanensis T. Koyama in Kihara, Fauna Fl. Nepal Himal. 87, f. 3 (1955).

NEPAL. Kyangjing, Langtang Khola, 3800 m (Jul. 15, 1970).

Distr. Himalaya (Nepal and Sikkim).

Carex Lehmannii Drejer, Symbol. Caricol. 13, t. 2 (1844)–C. B. Clarke in. Fl. Brit. Ind. **6**: 730 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 387 (1909).

NEPAL. Kyangjing, Langtang Khola, 3800 m (Jul. 14, 1970).

Distr. Himalaya and alpine regions of China and Japan.

Carex longipes D. Don: Fl. E. Himal. 382 (1966); **2**: 147 (1971).

NEPAL. Mul Kharka–Chipu, 2350 m (Aug. 20, 1969).

Distr. Himalaya, India, Indo-China, and C. China.

Carex melanantha C. A. Meyer ex Ledebour, Fl. Alt. **4**: 216 (1833)–C. B. Clarke in Fl. Brit. Ind. **6**: 733 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 391, f. 61, E–G (1909).

NEPAL. Oo Kharka–Mul Kharka, 3550 m (Jul. 1, 1970); Mul Kharka–Yatumbal, 3700 m (Jul. 7, 1970).

Distr. Turkestan, Afghanistan, Himalaya (Nepal), and S. Siberia.

Carex munda Boott: Fl. E. Himal. 383 (1966).

NEPAL. Mul Kharka–Chilime, 3800–4100 m (Jul. 2, 1970); Kokim Pokhari–Hati Surde, 3200 m (Jun. 11, 1972); Hile Chok–Ghopte, 3500 m (Jun. 12, 1972); Lama Chungbu–Thudam, 4200–3400 m (Jun. 24, 1972); Thudam, 3400 m (Jun. 25, 1972).

Carex Nakaoana T. Koyama: Fl. E. Himal. 383 (1966).

NEPAL. Gotiora–Gadje, 3280-3950 m (Aug. 25, 1969); Kyangjing, Langtang Khola, 3500-3900 m (Jul. 15, 1970).

This differs from *C. haematostoma* in the completely glabrous pistillate glumes and relatively slenderer habit, and from *C. hirtella* in the short-beaked utricles, which are not hairy on both sides.

Carex nubigena D. Don: Fl. E. Himal. 383 (1966); **2**: 147 (1971).

NEPAL. Kuwa Pani–Hile, 1900 m (Jun. 4, 1972); Hile–Mure, 2000 m (Jun. 5, 1972); Tute-Dor, 2600 m (Jun. 6, 1972); Topke Gola, 3700 m (Jun. 19, 1972).

Distr. Afghanistan, India, Ceylon, Himalaya, and China.

Carex obscura Nees in Wight, Contrib. Bot. Ind. 126 (1834)–C. B. Clarke in Fl. Brit. Ind. **6**: 731 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 388 (1909).

NEPAL. Surjakund (Aug. 26, 1969).

Distr. Himalaya (Kashmir to Sikkim) and Tibet.

Carex rara Boott: Fl. E. Himal. 384 (1966).

NEPAL. Lamo Pokhari, 2900 m (Jun. 9, 1972); Gupha Pokhari, 2800 m (Jun. 10, 1972).

Distr. Himalaya, China, and Japan (subsp. *biwensis*).

Carex Rochebrunii Franch. et Savat.: Fl. E. Himal. 384 (1966).

NEPAL. Gupha Pokhari, 2800 m (Jun. 10, 1972).

Because the plants from the Himalayas tend to be slenderer with fewer spikes than in the Japanese plants Kükenthal classified a number of Nepalese specimens as his var. *remotaeformis*. The differences between the Himalayan and Japanese populations of this species should be further looked into.

Cyperus[1] **brevifolius** (Rottboell) Hasskarl: Fl. E. Himal. 385 (1966); **2**: 149 (1971).

Kyllinga brevifolia Rottboell, Descr. Icon. 13, t. 4, f. 3 (1773).

NEPAL. Ingyur-Gul Bhanjyang, 2240–2100 m (Aug. 22, 1969); Khodang Danda-Latsu, 2400–2500 m (Aug. 29, 1972).

Distr. Widely spread with a number of local variants in the tropical, subtropical and warm-temperate regions of the world.

Cyperus difformis L.: Fl. E. Himal. 386 (1966).

NEPAL. Dakchin Kali-Okhre Danra, 1600 m (Sep. 1, 1970).

Distr. Tropical, subtropical and warm-temperate regions of the Old World. The occurrence of this species in the Neotropics may possibly be of introduced origin. Common weed in rice fields.

Cyperus diffusus Vahl: Fl. E. Himal. 386 (1966); **2**: 149 (1971).

NEPAL. Dingla-Doban, 700 m (Jul. 2, 1972).

Distr. Pantropic with many local variants in the Neotropics.

Cyperus Iria L.: Fl. E. Himal. 387 (1966); **2**: 150 (1971).

NEPAL. Doban, 800 m (Jul. 2, 1972); Sim Chotala-Gram, 900–1900 m (Aug. 20, 1972).

Distr. Cosmopolitan. A common weed in cultivated field. Assumingly a native of W. Asia.

Cyperus niveus Retzius, Obs. Bot. 5, 12 (1791)–Kükenthal in Pfl.-reich. IV-20, Ht. **101**: 288 (1935)–T. Koyama in Contrib. Inst. Bot. Univ. Montreal no. 70, 29 (1957).

NEPAL. Shyaprubensi, 1500 m (Jun. 27, 1970).

Distr. Asian highlands from Iran and Afghanistan through Himalaya to S.W. China and Tonkin.

Cyperus pumilus L.: Fl. E. Himal. 388 (1966).

Pycreus pumilus (L.) Domin in Bibl. Bot. **85**: 417 (1915).

NEPAL. Sim Chotala-Gram, 900–1900 m (Aug. 20, 1972).

Cyperus sanguinolentus Vahl: Fl. E. Himal. 388 (1966); **2**: 150 (1971).

Pycreus sanguinolentus (Vahl) Nees [in Linnaea **9**: 238 (1835), comb. nud.] ex C. B. Clarke in Fl. Brit. Ind. **6**: 590 (1893).

NEPAL. Ingyur-Gul Bhanjyang, 2100–2240 m (Aug. 22, 1969).

Cyperus tenuiculmis Böckeler in Linnaea **36**: 286 (1870)–Kern in Reinwardtia **3**: 30 (1954)–T. Koyama in Quart. Journ. Taiwan Mus. **14**: 169 (1961).

C. Zollingeri sensu C. B. Clarke in Fl. Brit. Ind. **6**: 613 (1893), non Steudel.

NEPAL. Dakchin Kali-Deorali, 1600 m (Sep. 1-2, 1970); Sim Chotala-Gram, 900–1900 m (Aug. 20, 1972).

Distr. Tropical Africa, Himalaya, India, Malaysia, Australia, and Formosa.

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1) Nowadays the general practice among cyperologists is to split the genus *Cyperus* s. lat. into at least five genera: *Cyperus* s. str., *Pycreus*, *Mariscus*, *Kyllinga* and *Torulinium*. Although the author will follow this concept in his other treatments, Kükenthal's traditional concept is followed here to maintain the consistency in generic systems in this series of report.

Eleocharis congesta D. Don: Fl. E. Himal. 390 (1966); **2**: 150 (1971).

NEPAL. Ingyur–Gul Bhanjyang, 2100–2240 m (Aug. 22, 1969).

Distr. India, Himalaya, Indo-China, S. China, and Japan (subsp. *japonica*).

Fimbristylis complanata (Retz.) Link: Fl. E. Himal. 390 (1966).

NEPAL. Chitlang, 1750 m (Sep. 4, 1970); Phulchoki, 2400–2700 m (Sep. 19, 1970).

Distr. Pantropic, also extending northwards to Japan and China.

Fimbristylis dichotoma (L.) Vahl: Fl. E. Himal. 391 (1966); **2**: 150 (1971).

NEPAL. Sundarijar–Mul Kharka, 1680 m (Aug. 20, 1969); Tanguni–Chipling, 2000 m (Aug. 21, 1969); Bainse–Mane Gaon, 700–1240 m (Jun. 23, 1970); Chitlang, 1750 m (Sep. 4, 1970); Barabise–Thale, 850–2050 m (Sep. 9, 1970); Sim Chotala, 900 m (Aug. 20, 1972).

Fimbristylis falcata (Vahl) Kunth, Enum. Pl. **2**: 239 (1837).

Scirpus falcatus Vahl, Enum. Pl. **2**: 275 (1806).

Trichelostylis junciformis Nees in Wight, Contrib. Bot. Ind. 106 (1834).

F. junciformis (Nees) Kunth, Enum. Pl. **2**: 239 (1837)–C. B. Clarke in Fl. Brit. Ind. **6**: 647 (1893).

NEPAL. Simra–Patlaia, 200 m (Apr. 17, 1969).

Distr. Madagascar, Ceylon, India, Himalaya, Thailand, Indo-China, and Malaysia.

Fimbristylis littoralis Gaudich.: Fl. E. Himal. 391 (1966).

NEPAL. Sim Chotala, 900 m (Aug. 20, 1972).

Distr. Widely distributed in the Palaeotropics, also extending northwards to China and Japan; assumingly naturalized in the Neotropics.

This is *Fimbristylis miliacea* of many authors including C. B. Clarke (in Hook. f., Fl. Brit. Ind. **6**: 644, 1893). According to S. T. Blake (in Journ. Arn. Arb. **35**: 216, 1954), the Linnaean specimen of *Scirpus miliaceus*, on which Linnaeus handwriting, "*miliaceus*", appears, represents *F. quinquangularis* Kunth, and for this reason Blake has referred the name *F. miliacea* to *F. quinquangularis*. The binomial, *F. littoralis*, becomes the correct name for the species that has been commonly passing as *F. miliacea*. Although I follow Blake's view in this treatment, there is still arguments about this typification (cf. Kern in Taxon **3**: 246, 1954).

Fimbristylis Pierotii Miquel, Ann. Mus. Bot. Lugd.-Bat. **2**: 145 (1865)–C. B. Clarke in Fl. Brit. Ind. **6**: 642 (1893).

NEPAL. Dunche–Shyaprubensi, 1600 m (Jun. 26, 1970).

Distr. N. India, Himalaya, C. & S. China, Korea, Japan, and the Philippines.

This species superficially resembles *F. stolonifera*, especially because of its slender stolons covered with brown scales, but can be easily segregated from it by the glumes, which are at least in part disposed distichously against the spirally imbricated ones in the latter. Namely, *F. Pierotii* belongs to the section Abildgaardia.

Kobresia curticeps (C. B. Clarke) Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 47 (1909).

Carex curticeps C. B. Clarke in Fl. Brit. Ind. **6**: 729 (1894).

NEPAL. Thudam, 3400 m (Jun. 25, 1972).

Distr. E. Himalaya.

A well marked species by its large, paniculiform inflorescences, which become quasi-lateral with the erect lowest bract.

Kobresia curvata Kükenthal in Pfl.-reich. IV-20, Ht. **38**: 48, f. 12 (1909).

Carex curvata Boott, Ill. Carex **1**: 2, t. 5 (1858), non Knaf (1847)–C. B. Clarke in Fl. Brit. Ind. **6**: 728 (1894).

NEPAL. Yatumbal–Oo Kharka, 3400 m (Jun. 30, 1970); Oo Kharka–Mul Kharka, 3700 m (Jul. 1, 1970); Mul Kharka–Yatumbal, 3800–2700 m (Jul. 7, 1970); Kyangjing, Langtang, 3800 m (Jul. 15, 1970); Thudam, 3400 m (Jun. 25, 1972).

Distr. E. Himalaya (Nepal and Sikkim).

Kobresia Deasyi C. B. Clarke in Kew Bull. Add. Ser. **8**: 68 (1908).

K. pamiroalaica Ivanova in Journ. Bot. U.R.S.S. **24**: 418 (1939).

K. pamiralaica Ivanova in Schreder, Fl. Uzbek. **1**: 347 & 540 (1941).

NEPAL. Kyangjing, Langtang, 3900 m (Jul. 15, 1970).

Distr. Afghanistan, Pamir, and Himalaya (Nepal).

Kobresia pamiralaica, easily recognizable by the rather robust habit with thickish cylindrical inflorescences as long as 6 cm, has an earlier valid name, *K. Deasyi*. Examination of Clarke's type at Kew verified this identity.

Kobresia Duthiei C. B. Clarke in Fl. Brit. Ind. **6**: 697 (1894).

NEPAL. Mane–Thale Patil, 3500 m (Aug. 24, 1969); Lukthang–Kuri, 3400 m (Sep. 28, 1970).

Distr. Himalaya.

Kobresia laxa Nees in Wight, Contrib. Bot. Ind. 119 (1834)–C. B. Clarke in Fl. Brit. Ind. **6**: 698 (1894)–Kükenthal in Pfl.-reich. IV-20, Ht. **38**: 47, f. 11 (1909).

NEPAL. Kyangjing–Langtang Gorge, 3800–3000 m (Jul. 16, 1970).

Distr. Himalaya.

This is one of the commonest species of *Kobresia* in Nepal, and is characteristic in the elongated spikes with bright red-brown glumes, which are disposed in diffuse paniculiform inflorescences.

Kobresia nepalensis (Nees) Kükenthal in Pfl.-reich. IV-20, Ht. **38**: 40, f. 9 (1909).

Uncinia nepalensis Nees in Wight, Contrib. Bot. Ind. 129 (1834).

Carex linearis Boott, Ill. Carex **1**: 51, t. 136 (1858)–C. B. Clarke in Fl. Brit. Ind. **6**: 712 (1894).

NEPAL. Mul Kharka–Chilime Khola, 3800–4100 m (Jul. 6, 1970); Langtang–Kyangjing (Jul. 13, 1970).

Distr. Himalaya (Nepal and Sikkim).

Kobresia pygmaea (C. B. Clarke) C. B. Clarke: Fl. E. Himal. **2**: 151 (1971).

Hemicarex pygmaea C. B. Clarke in Journ. Linn. Soc. **20**: 383 (1883).

NEPAL. Langtang–Kyangjing, 3500 m (Jul. 13, 1970).

Distr. Himalaya and Tibet.

Among the small species of Himalayan *Kobresia* this can be identified relatively easily by the bisexual fruiting spikelets, which normally bear a staminate flower on the rhacheola.

Kobresia seticulmis Böckeler in Linnaea **39**: 3 (1875)–C. B. Clarke in Fl.

Brit. Ind. **6**: 695 (1894)–Kükenthal in Pfl.-reich. IV-20, Ht. **38**: 92 (1909).

Nepal. Thale Patil–Rock Shelter, 3400 m (Aug. 24, 1969); Mul Kharka–Chilime Khola, 4000 m (Jul. 3, 1970); Hile Chok–Ghopte, 3550 m (Jun. 12, 1972).

Distr. Himalaya (Kumaon, Nepal, and Sikkim).

Kobresia trinervis (Nees) Böckeler in Linnaea **39**: 4 (1875), in adnota–C. B. Clarke in Fl. Brit. Ind. **6**: 695 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 43, f. 10 (1909).

Carex trinervis Nees in Wight, Contrib. Bot. Ind. 120 (1834), non Degland (1807).

Nepal. Mul Kharka–Chilime Khola, 3800–4110 m (Jul. 3, 1970).

Distr. Himalaya (Sikkim and adjoining Tibet) and Yunnan.

A distinct dioecious species with rather broad leaves and showy inflorescences.

Kobresia uncinoides (Boott) C. B. Clarke in Fl. Brit. Ind. **6**: 698 (1894)–Kükenthal in Pfl.-reich. IV–20, Ht. **38**: 46 (1909).

Carex uncinoides Boott, Ill. Carex **1**: 8, t. 23 (1858).

Nepal. Topke Gola, 3800 m (Jun. 18, 1972).

Distr. E. Himalaya, Tibet, and S.W. China (Yunnan and Kansu).

Kobresia Williamsii T. Koyama in Bot. Mag. Tokyo **86**: 279, f. 3 (1973).

Nepal. Thudam–Lama Chungbu, 3600 m (Jun. 23, 1972).

Distr. Himalaya (C. & E. Nepal).

A distinct species with long-creeping rhizomes and partially paniculiform inflorescences. Although superficially resembling *K. uncinoides* it is quite dissimilar thereto by the completely glabrous perigynia in addition to the creeping rhizomes.

Scirpus planifolius Grimm in Nov. Act. Nat. Cur. 3, App. 259 (1767)–Ohwi et Koyama in Kihara, Fauna Fl. Nepal Himal. 90 (1955).

Schoenus compressus L., Sp. Pl. ed. 1, 43 (1753).

Blysmus compressus (L.) Panzer ex Link, Hort. Bot. Berol. **1**: 278 (1827).

Nepal. Langtang–Langtang Khola, 3400 m (Jul. 12, 1970); Langtang–Kyangjing, 3500 m (Jul. 13, 1970).

Distr. Europe, C. Asia, Pakistan, N. India, Himalaya, and S.W. China.

ARACEAE (by Hiroshi Hara)

Arisaema costatum (Wall.) Mart.: Hara, Fl. E. Himal. **2**: 152 & 332, pls. 6c & 17, f. 50C (1971).

Nepal. Thodang Danda–Duche Gyang, 2300 m (Aug. 30, 1969, young fr.); Thale–Dunche, 2200 m (Jun. 25, 1970, fl.); Thale–Thale Bisauna, 2050–2750 m (Sep. 10, 1970, fr.); Sinduwa–Bhalukhop, 2300 m (Jun. 5, 1972, no. 720189, fl.); Chitre–Dor, 2300–2600 m (Jun. 6 & Jul. 7, 1972); Chauke–Dor, 2900–2600 m (Jul. 6, 1972, fl.); Chitre–Hile, 2400–1900 m (Jul. 8, 1972, young fr.).

Distr. C. & E. Nepal.

Arisaema echinatum (Wall.) Schott: Fl. E. Himal. **2**: 152 & 351, pl. 20c–d, f. 55M (1971).

Nepal. Yatumbal, 2700 m (Jun. 30, 1970, fl.); Phulchoki, 2600 m (Jun. 20, 1970 & Jul. 15, 1972); Dor–Chauke, 2600–2700 m (Jun. 7 & Jul. 6, 1972, no. 723076, fl.).

Distr. C. & E. Nepal.

Arisaema exappendiculatum Hara: Fl. E. Himal. 395, pls. 8a–c & 23

(1966); **2**: 153 & 353, pl. 20a-b, f. 56 (1971).

NEPAL. Sinduwa-Chitre, 2200-2300 m (Jun. 5, 1972, no. 720190, fl.); Chitre-Dor, 2300-2600 m (Jun. 6 & Jul. 7, 1972, young fr.); Dor-Chauke, 2600-2900 m (Jun. 7, 1972, fl. & Jul. 6, 1972); Chitre-Hile, 2400-1900 m (Jul. 8, 1972, young fr.).

Distr. C. & E. Nepal.

Arisaema vexillatum Hara et Ohashi in Journ. Jap. Bot. **48**: 99, pl. 1 right, f. 1 (1973).

NEPAL. Thudam, 3400 m (Jun. 24, 1972, no. 723074. Holotype in TI; Jun. 26, 1972).

Distr. Endemic to E. Nepal.

JUNCACEAE (by Yoshisuke Satake)

Juncus albescens Satake in Fl. E. Himal. **2**: 161, f. 13 (1971).

NEPAL. Lamo Pokhari, 2900 m (Jun. 9, 1972, young fl.).

Distr. E. Himalaya (Nepal and Bhutan).

Juncus bhutanensis Satake: Fl. E. Himal. **2**: 162 (1971).

NEPAL. Gadje-Gosainkund, 3920-4260 m (Aug. 26, 1969, fl.); Suke-Hile Chok, 2900-3500 m (Jun. 11, 1972, fl.); Saju Pokhari-Topke Gola, 3600-4400 m (Jun. 16, 1972, fl.); Lama Chungbu-Thudam, 3400-4500 m (Jun. 24, 1972, fl.); Mul Kharka, 3800-4100 m (Jul. 3, 1970, fl.); Gosainkund-Gopte, 3500-4400 m (Aug. 25, 1972, young fr.).

Distr. E. Himalaya (Nepal to Bhutan).

Juncus Clarkei Buchen.: Satake in Fl. E. Himal. 402 (1966).

BHUTAN. Chamsa-Yabu Thang, 3200-3700 m (May 15, 1967, fr.).

Juncus effusus L.: Fl. E. Himal. 402 (1966); **2**: 162 (1971).

NEPAL. Tangjet-Khirojet, 1750-2300 m (Jun. 28 1970, fr.).

Juncus Grisebachii Buchen.: Fl. E. Himal. 402 (1966).

NEPAL. Dobate-Rock Shelter II, 3220-3550 m (Aug. 24, 1969, fl.); Tingoang-Khosori Khabre, 3000 m (Sep. 12, 1970, fl.); Gopte-Thale Patil, 3200-3500 m (Aug. 26, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan).

Juncus leucanthus Royle ex D. Don: Fl. E. Himal. 403 (1966); **2**: 163 (1971).

NEPAL. Suke-Hile Chok, 2900-3500 m (Jun. 11, 1972, fl.).

Distr. E. Himalaya (Nepal to Bhutan).

Juncus luteocarpus Satake: Fl. E. Himal. **2**: 163 (1971).

NEPAL. Bhorlang-Ingyur, 1750-2440 m (Aug. 21, 1969, fl.); Thudam, 3400 m (Jun. 25, 1972, fl.); Topke Gola-Shewaden, 2600-3600 m (Jun. 28, 1972, fl.).

Distr. E. Himalaya (Nepal and Bhutan).

Juncus monticola Steud.: Fl. E. Himal. 403 (1966); **2**: 163 (1971).

NEPAL. Ingyur-Gul Bhanjyang, 2100-2240 m (Aug. 22, 1969, young fr.); Hile-Chitre, 1900-2400 m (Jun. 5, 1972, young fl.); Nessum-Bhuje, 1300-2700 m (Jul. 3, 1972, fl.); Bhuje-Chauke, 2700-2900 m (Jul. 4, 1972, fr.).

Distr. India and Himalaya to Japan.

Juncus sikkimensis Hook. f.

var. **monocephalus** Hook. f., Fl. Brit. Ind. **6**: 399 (1892)-Buchen., Junc. 234 (1906).

NEPAL. Rock Shelter II-Gadje, 3220-3950 m (Aug. 25, 1969, fr.); Mul Kharka, 3800-

4100 m (Jul. 2–3, 1970, fl.).

Distr. Nepal and Sikkim.

According to Dr. H. Kanai, the plant is common in the locality, and the flowers are small, but very pretty, characterized by the dark brown perianth-segments, included yellow anthers, exserted styles, and elongate salmon pink stigmas in anthesis.

Juncus sphacelatus Decne.: Fl. E. Himal. 403 (1966).

NEPAL. Gadje–Gosainkund, 3920–4450 m (Aug. 26, 1969, young fr.); Mul Kharka, Chilime Khola, 3800–4100 m (Jul. 3 & 6, 1970, fl.); Lama Chungbu–Thudam, 3400–4500 m (Jun. 24, 1972, fl.).

Distr. Afghanistan and Himalaya.

Juncus sphenostemon Buchen.: Fl. E. Himal. 403 (1966); **2**: 164 (1971).

NEPAL. Singum Gompa, 3000 m (Jun. 4, 1969, fl.); Oo Kharka–Mul Kharka, 3400–3800 m (Jul. 1, 1970, young fr.); Thale–Thale Bisauna, 2050–2750 m (Sep. 10, 1970, fl.).

Juncus Thomsonii Buchen.: Fl. E. Himal. **2**: 164 (1971).

NEPAL. Lukthang–Kuri, 3250–3650 m (Sep. 28, 1970, fr.).

Luzula oligantha Samuelss.: Fl. E. Himal. **2**: 164 (1971).

NEPAL. Rock Shelter II–Gadje, 3200–3950 m (Aug. 25, 1969, fr.); Yatumbal–Oo Kharka, 2700–3400 m (Jun. 30, 1970, fr.); Oo Kharka–Mul Kharka, 3400–3800 m (Jul. 1, 1970, fr.); Mul Kharka, Chilime Khola, 3800–4100 m (Jul. 3, 1970); Gram–Dunche, 1900–2000 m (Aug. 21, 1972, fl.).

DARJEELING. Phalut–Singalila, 3600–3700 m (Aug. 3, 1972, fr.).

Luzula plumosa E. Meyer: Fl. E. Himal. **2**: 164 (1971).

NEPAL. Thale Bisauna–Tingoang, 2770–3240 m (Apr. 17, 1970, young fl.); Dor–Chauke, 2600–2900 m (Jun. 7, 1972, fr.).

LILIACEAE (by Hiroshi Hara, *Smilax* by Tetsuo Koyama)

Chlorophytum arundinaceum Baker in Journ. Linn. Soc. **15**: 323 (1876)–Hook. f., Fl. Brit. Ind. **6**: 333 (1892).

C. breviscapum Dalzell sensu Hook. f., Fl. Brit. Ind. **6**: 333 (1892), quoad pl. ex Sikkim: Hara, Fl. E. Himal. 406 (1966).

Distr. Himalaya (Nepal to Bhutan), Khasia, ?S. India, and Burma.

Chlorophytum khasianum Hook. f., Fl. Brit. Ind. **6**: 334 (1892), e typo–Hand.-Mzt., Symb. Sin. **7**: 1194 (1936).

C. arundinaceum Baker sensu Hara, Fl. E. Himal. 406 (1966).

Distr. Himalaya (Nepal to Bhutan), Khasia, N. Burma, and W. China.

Disporum leucanthum Hara in Journ. Jap. Bot. **47**: 114 (1972).

DARJEELING. Kurseong, 1550 m (Togashi, Apr. 12, 1960, no. 6602. Holotype in TI).

Distr. E. Himalaya (Sikkim).

This species is clearly distinguished from *Disporum cantoniense* (Lour.) Merrill in having terminal few-flowered inflorescences, white widely opening flowers, and smooth pedicels and tepals.

Lilium nanum Klotzsch ex Klotzsch et Garcke, Reis. Prinz Waldem. 53 (1862)–Sealy in Kew Bull. **1950**: 283, f. 4 E–O (1950).

Fritillaria oxypetala Royle sensu Hook. in Bot. Mag. t. 4731 (1853).

F. Stracheyi Hook. f., Fl. Brit. Ind. **6**: 353 (1892).

Nomocharis nana (Klotzsch) E. H. Wilson, Lilies E. Asia 13 (1925)–Evans in Not. Bot. Gard. Edinb. **15**: 16, t. 202 & 203 (1925)–Woodcock et Stearn, Lilies of World 388 (1950).

NEPAL. Banduke Pokhari–Saju Pokhari, 4200 m (Jun. 15, 1972, fl.); Saju Pokhari–Topke Gola, 4200 m (Jun. 16, 1972, no. 723064, fl.); Lama Chungbu, 4200 m (Jun. 23, 1972, fl.); Kipudonsu–Kipuphu, 4300 m (Jun. 26, 1972, no. 720779, fl. violet purple outside).

Distr. Himalaya (Punjab to NEFA), S.E. Tibet, and W. China.

f. **flavidum** (Rendle) Hara, comb. nov.

Fritillaria flavida Rendle in Journ. Bot. **44**: 45 (1906).

NEPAL. Banduke Pokhari–Saju Pokhari, 4200 m (Jun. 15, 1972, fl); Saju Pokhari–Topke Gola, 4200 m (Jun. 16, 1972, no. 720532, fl. pale yellow); Lama Chungbu, 4200 m (Jun. 24, 1972, fl.).

Lilium Wallichianum J. A. et J. H. Schutles, Syst. Veg. **7** (2): 1689 (1830)–Fl. Brit. Ind. **6**: 349 (1892)–Woodcock et Stearn, Lilies of World 361 (1950).

var. **neilgherrense** (Wight) Hara, comb. nov.

Lilium neilgherrense Wight, Icon. **6**: 20, t. 2031–2 (1853)–Baker in Bot. Mag. t. 6332 (1877)–Elwes, Monogr. Lilium t. 6 (1877)–Fl. Brit. Ind. **6**: 350 (1892)–Woodcock et Stearn, l.c. 287, f. 83 (1950).

L. tubiflorum Wight, l.c. 20, t. 2033–4 (1853).

L. Wallichianum Roem. et Schult. sensu Wight, l.c. t. 2035 (1853).

L. neilgerricum Lemaire, Ill. Hort. **10**: t. 353 (1863).

L. longiflorum Thunb. subsp. *neilgherrense* (Wight) Baker in Gard. Chron. **1871**: 479 (1871).

NEPAL. Shyaprubensi, 1500 m (Jun. 26, 1970, no. 672052, fl. white, yellowish inside the tube).

Distr. Himalaya (C. Nepal) and S. India.

The leaves are lanceolate and 1–2 cm wide, and the Nepalese plants agree with those from the Nilghiri Mts.

Lloydia flavonutans Hara in Journ. Jap. Bot. **49**: 202 (1974).

Lloydia Delavayi Franch. sensu Hara, Fl. E. Himal. 408 & 655, f. 63f (1966).

NEPAL. Ghopte–Gosa, 4000 m (Jun. 13, 1972, fl.); Topke Gola, 3600 m (Jun. 17, 1972, fl.).

Distr. Himalaya (Nepal to N. Assam) and S. Tibet.

This species has nodding yellow flowers with reddish orange patches at the basal part, smooth inner tepals without crests, and ovary acutish at the apex. *L. Delavayi* Franch. is a densely gregarious plant wrapped by dead leaves in the basal part, and has oblong-obovate inner tepals pilose inside in the lower part, and longer filaments and styles.

Lloydia longiscapa Hook., Icon. Pl. **9**: t. 834 (1852)–Franch. in Journ. de Bot. **12**: 195 (1898)–Hara, Fl. E. Himal. 655, f. 63b (1966).

Gagea pulchella Wall., Cat. no. 5064 (1832), nom. nud.

NEPAL. Ghopte–Gosa, 4000 m (Jun. 13, 1972, fl.); Banduke Pokhari–Saju Pokhari, 4100 m (Jun. 15, 1972, fl.); Thudam–Kipuphu, 3400–4500 m (Jun. 26, 1972, fl.).

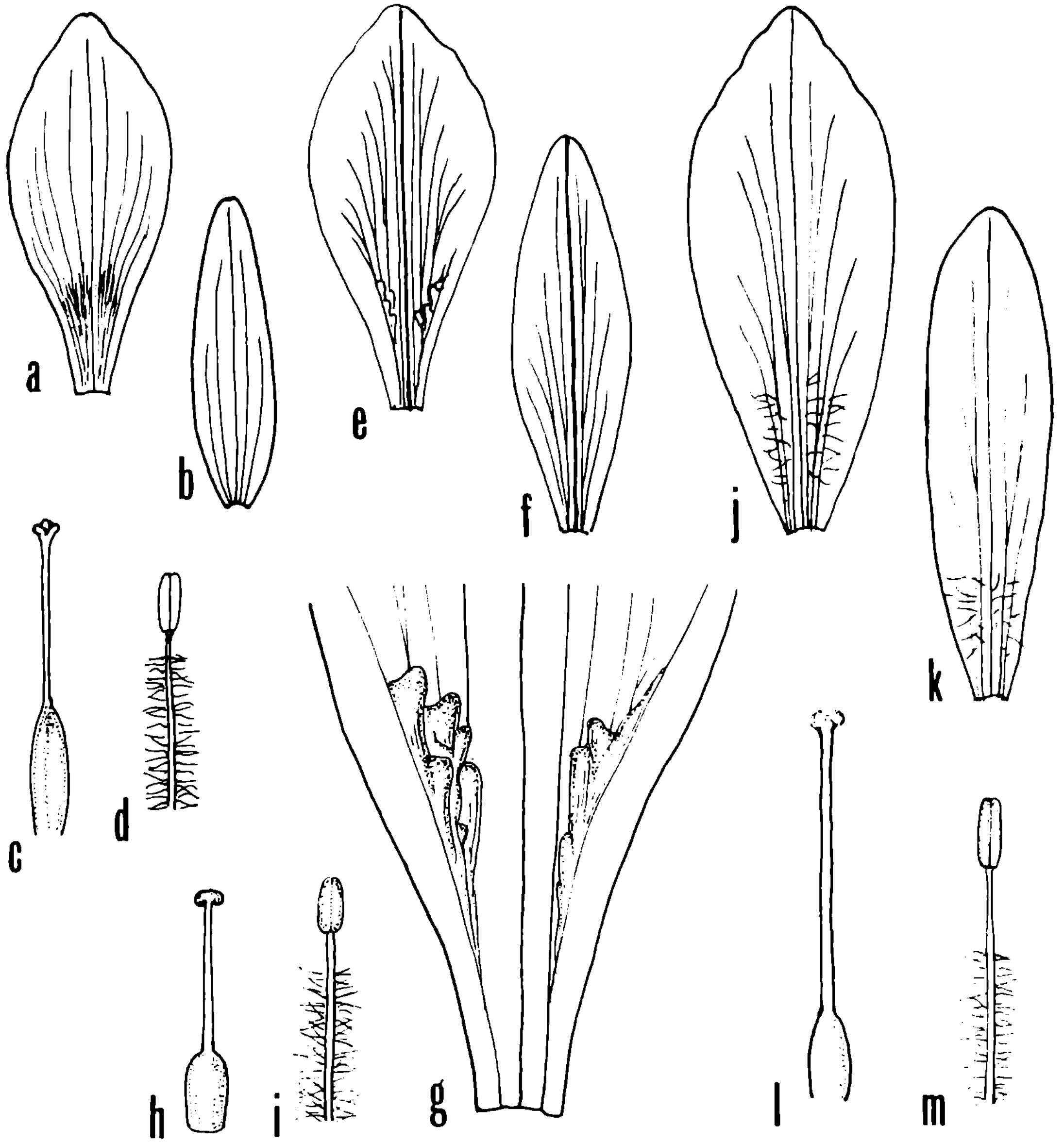

Fig. 13. *Lloydia flavonutans* Hara (a–d), *L. tibetica* Baker (e–i), and *L. Delavayi* Franch (j–m). a, e & j. Inner tepal. ×3, b, f & k. Outer tepal. ×3, c, h & l. Pistil. ×3, d, i & m. Stamen. ×3, g. A part of inner tepal. ×10.

Distr. Himalaya (Kashmir to Bhutan), S. Tibet, and W. China.

Lloydia serotina (L.) Reichb.

var. **para** (Marq. et Shaw) Hara, Fl. E. Himal. **2**: 166 (1971).

NEPAL. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972, fl.); Ghopte–Gosa, 3900 m (Jun. 13, 1972, no. 720375, fl.); Gosa–Banduke Pokhari, 4100–4200 m (Jun. 14, 1972, fl.); Saju Pokhari–Topke Gola, 4400–3600 m (Jun. 16, 1972, fl.).

Distr. Himalaya (Nepal to Bhutan) and S. Tibet.

It is noteworthy that in this variety some specimens have no fold at the base of tepals, but some have a transverse fold near the base of tepals as in typical *L. serotina.*

Lloydia tibetica Baker in Hook., Icon. Pl. t. 2216 (1892).

NEPAL. Mul Kharka, Chilime, 4100 m (Jul. 2, 1970, no. 672229, fl. yellow).

Distr. Himalaya (Nepal), S. Tibet, and W. China.

This species is characterized in having inner tepals with crest on both sides in the lower part, yellow flowers with greenish veins, ovary obtuse at the apex, and flat leaves 2–4 mm wide.

Paris polyphylla Smith[1] in Rees, Cyclop. **26**: *Paris* no. 2 (1813)–Hara in Journ. Fac. Sci. Univ. Tokyo Bot. **10**: 175 (1969); Fl. E. Himal. **2**: 167 (1971).

var. **polyphylla**

P. polyphylla var. *brachystemon* Franch.: Hara, l.c. 176 (1969); l.c. **2**: 167 (1971).

var. **Wallichii** Hara, var. nov.

P. polyphylla Smith sensu Wall., Icon. Pl. As. Rar. **2**: 24, t. 126 (1831)–Hara, l.c. 175, f. 1A–D (1969).

Planta saepe robusta. Folia vulgo obovato-oblonga apice longe acuminata basi saepe rotundata, petiolis distinctis longis. Petala anguste linearia valde exserta, interdum ad 8 cm longa. Antherae longae lineares.

SIKKIM. Yoksam (Hara et al. May 17, 1960, no. 7738. Holotype in TI).

The type specimen of *Paris polyphylla* Smith (Fig. 14) is a slender race which has narrow leaves cuneate at the base, short petioles, generally smaller flowers, and shorter anthers, and it is rather near to var. *brachystemon* Franch. Var. *Wallichii* is a common race in the Himalayas, and it is more robust, and has larger broader leaves often roundish at the base, distinct longer petioles, and often larger flowers with longer petals and longer anthers. Some intermediate forms between these two races also occur here and there. But the two varieties keep their characters unchanged, even when they have been cultivated side by side in Japan for several years.

Polygonatum curvistylum Hua in Journ. de Bot. **6**: 424 (1892).

P. graminifolium Hook. sensu Hara, Fl. E. Himal. **2**: 168 (1971).

NEPAL. Singum Gompa, 2900 m (Aug. 22, 1972).

Distr. Himalaya (Nepal to Bhutan) and W. China.

Smilax ferox Wallich [Cat. no. 5129 (1830), nom. nud.] ex Kunth: T. Koyama in Fl. E. Himal. 415 (1966); **2**: 171 (1971).

NEPAL. Khodang Danda–Gul Bhanjyang, 2300 m (Aug. 29, 1972).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972).

Distr. Himalaya, N. Burma, N. Indo-China, and S. & S.W. China.

Smilax glaucophylla Klotzsch: Fl. E. Himal. 415 (1966); **2**: 171 (1971).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972); Dunche-Singum Gompa, 2000–3200 m (Aug. 22, 1972).

Distr. Himalaya.

Smilax menispermoidea A. DC.: Fl. E. Himal. 415 (1966); **2**: (1971).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972).

Smilax ovalifolia Roxburgh: Fl. E. Himal. 417 (1966).

NEPAL. Tamur Bridge–Mohamabedi Khola, 300 m (Jul. 9, 1972).

Distr. India, Himalaya, Burma, Thailand, and Indo-China.

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1) Type: NEPAL, Narainhetty (Hamilton, Mar. 13, 1803, in Smith Herb. at the Linnean Soc., London). [Fig. 14]

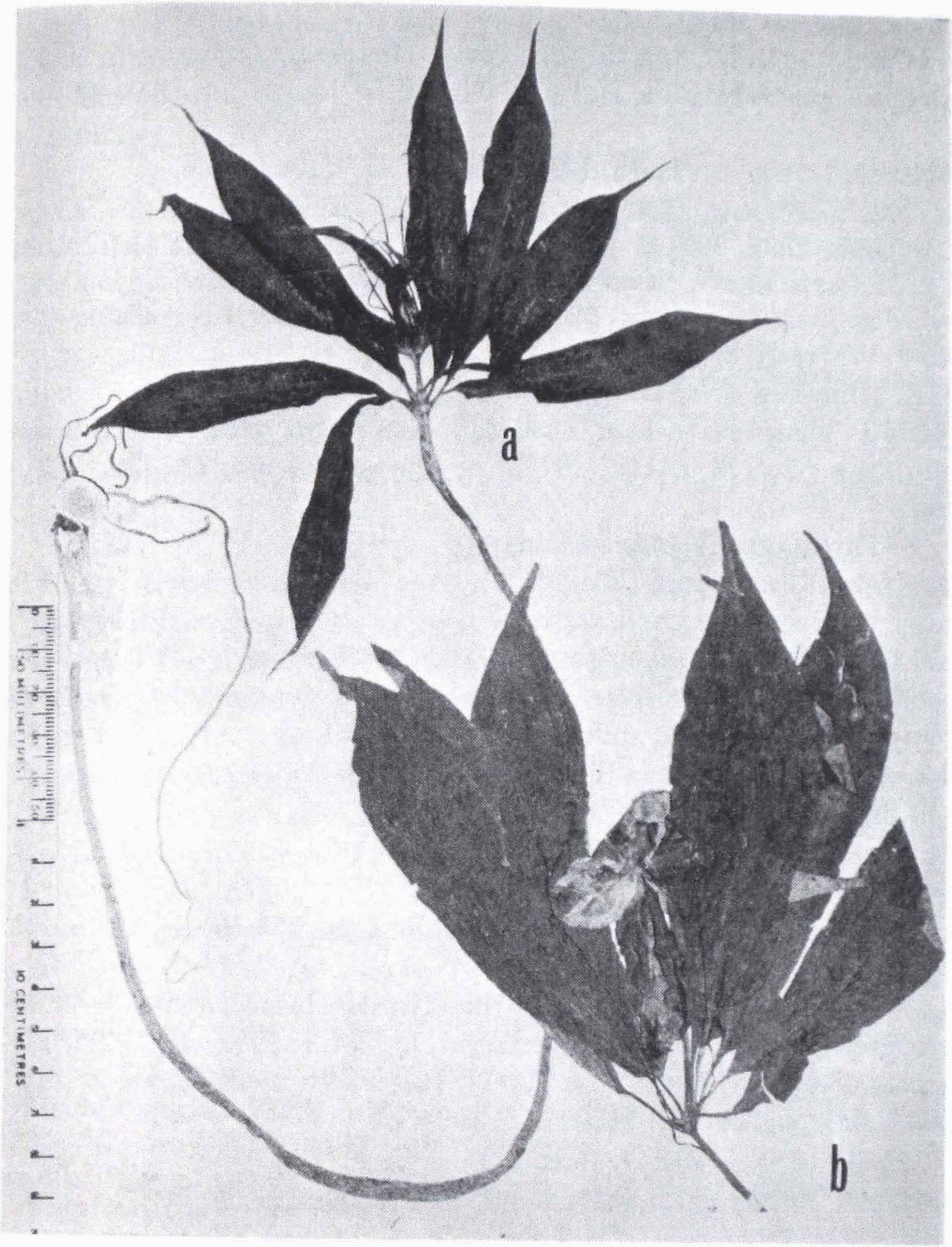

Fig. 14. *Paris polyphylla* Smith in Herb. Smith at Linnean Society, London. a. Type: Nepal, Narainhetty (Buch.-Ham. Mar. 13, 1803), b. var. *Wallichii* Hara: Nepal (Wallich ann. 1819).

Smilax vaginata Decne. in Jacquemont, Voy. **4** (Bot.): 169, t. 169 (1844).
NEPAL. Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972).
Distr. Himalaya; subsp. *stans* occurring in China and Japan.

Smilax zeylanica L., Sp. Pl. ed. 1, 1429 (1753)–A. DC., Monogr. Phaner. **1**: 190 (1878)–Hook. f., Fl. Brit. Ind. **6**: 310 (1892)–T. Koyama in Adv. Front. Pl. Sci. **4**: 50 (1961).

S. indica Vitman, Summa Pl. **4**: 422 (1790).

S. Hochennackeri Kunth, Enum. Pl. **5**: 240 (1850).

NEPAL. Dhara Pani–Mohamabedi Khola, 700 m (Jun. 3, 1972); Dingla–Nessum, 1000–1300 m (Jul. 2, 1972).

Distr. Himalaya, India, and Ceylon; subsp. *Hemsleyana* occurring in N. Thailand.

Streptopus parasimplex Hara et Ohashi in Journ. Jap. Bot. **48**: 101, f. 2B (1973).

S. simplex D. Don sensu Hara, Fl. E. Himal. 417 (1966), p.p.

NEPAL. Kokim Pokhari, 3200 m (Jun. 11, 1972); Hile Chok–Ghopte, 3500 m (Jun. 12, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972, no. 723120, fl. Holotype in TI); Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972).

SIKKIM. Migothang–Nayathang, 4200–3300 m (Jun. 1, 1960); Nayathang–Chia Bhanjyang, 3500–3100 m (Jun. 2, 1960).

Distr. E. Himalaya (Nepal to Bhutan).

Streptopus simplex D. Don, Prodr. Fl. Nepal. 48 (1825)–Hara, Fl. E. Himal. 417 (1966), p.p.; **2**: 173, t. 11a (1971); in Journ. Jap. Bot. **48**: 102, f. 2A (1973), in adnota.

Distr. E. Himalaya (Nepal, Sikkim).

Type: NEPAL, Gosainthan (Wallich s.n. Aug. 1819 in BM).

Recently the specimen cited above which is considered as the type of D. Don was found in the British Museum, and it has deeply trifid styles. *Streptopus parasimplex* is different from typical *S. simplex* by narrower leaves generally less than 2 cm wide, and shortly trifid styles with short lobes 1–1.5 mm long.

Tupistra nutans Wall. in Bot. Reg. **15**: t. 1223 (1829)–Bot. Mag. t. 3054 (1831)–Fl. Brit. Ind. **6**: 324 (1892).

SIKKIM. Pamianchi–Tingling Bridge (May 15, 1960); cult. in Tokyo from Sikkim (Dec. 7, 1972, fl.).

Distr. E. Himalaya (Nepal, Sikkim) and Khasia.

MUSACEAE (by Hiroshi Hara)

Ensete glaucum (Roxb.) Cheesman in Kew Bull. **1947**: 101 (1948).

Musa glauca Roxb., Corom. Pl. t. 300 (1819); Fl. Ind. ed. Carey, **2**: 490 (1824)–Baker in Fl. Brit. Ind. **6**: 262 (1892).

NEPAL. Illam, 1200 m (Dec. 7, 1963, fl.).

Distr. Nepal, India, Burma, Thailand, and Malaysia.

This may be *Musa nepalensis* Wallich in Roxb., Fl. Ind. ed. Carey, **2**: 492 (1824) (cf. a note by Cheesman, l.c. 101, 1948).

Musa Balbisiana Colla, Mem. Gen. Musa 56 (1820)–Cheesman in Kew Bull. **1948**: 14 (1948).

M. sapientum L. sensu Baker in Fl. Brit. Ind. **6**: 262 (1892), p.p.

NEPAL. Ghorwa–Sanichare, 200–300 m (Dec. 10, 1963, fl.).

Distr. Tropical Himalaya (Nepal, Sikkim), India, Ceylon, Burma, Thailand, and Malaysia.

The identification is provisional. More material from E. Himalaya is needed for critical studies of this group.

ZINGIBERACEAE (by Hiroshi Hara)

Roscoea capitata Smith in Trans. Linn. Soc. **13**: 461 (1822)–Wall., Pl. As.

Rar. **3**: t. 255 (1832)–Baker in Fl. Brit. Ind. **6**: 208 (1890).

NEPAL. Trisuli Khola, 2000 m (Aug. 22, 1972, fl. purple); Singum Gompa, 3200 m (Aug. 23, 1972, fl.).

Distr. Himalaya (Nepal).

ORCHIDACEAE (by Takasi Tuyama)

Anoectochilus lanceolatus Lindley, Gen. Sp. Orch. 499 (1840); in Journ. Linn. Soc. **1**: 179 (1857)–King et Pantl., Orch. Sikkim. 295, t. 392 (1898). [Plate 7f]

Odontochilus lanceolatus (Lindley) Bentham [in Bentham et Hooker f., Gen. Pl. **3**: 589 (1883), comb. nud.] ex Hooker f., Fl. Brit. Ind. **6**: 101 (1890); in Ann. Bot. Gard. Calc. **5**: 59, t. 89 (1895).

DARJEELING. Around Simkuna, 2200 m, on mossy rocks by a ravine in the forest (Aug. 10, 1972).

Distr. Temperate E. Himalaya (Darjeeling, Sikkim) and Khasia.

Colour of the flower is as shown in Pl. 7f. Lindley says "Lip white with brown fringes." According to Mr. Ohba's field note, "lip bright yellow, the other tepals greenish". Inside the short spur there are two falcately recurved calli located longitudinally, one in each subdivided chamber of the spur. This feature seems characteristic to the species.

J. D. Hooker says that the lip is golden yellow in his Flora of British India, but later in his "A Century of Indian Orchids", it is violet-purple including the sepals and petals. J. D. Hooker says that the colour is variable. Our plants agree in colour very well with that of King and Pantling.

Anthogonium gracile Lindley: Tuyama in Fl. E. Himal. 425 (1966).

NEPAL. Sheopuri, 2500 m (Jul. 22, 1970); Latsu–Bhorlang, 1700 m (Aug. 30, 1972).

DARJEELING. Sandakphu–Phalut, 3600–3200 m (Aug. 2, 1972); Raman–Rimbick, 3600–3200 m (Aug. 5, 1972); Rimbick–Palmajua, 2200–1500 m (Aug. 6, 1972); Darjeeling–Thame, 2200–2000 m (Aug. 12, 1972).

Aphyllorchis alpina King et Pantling, Orch. Sikkim. 261, t. 347 (1898).

NEPAL. Dor–Chitre, 2600–2300 m (Jul. 7, 1972).

DARJEELING. Phalut–Raman, 3500–2100 m (Aug. 4, 1972); Batassi, 2200–2100 m (Aug. 8, 1972).

The specimens were collected too late in the flowering season and were in poor condition. Determination was made on general appearance, strongly deflexed floral bracts, and the rhizomes with imbricating small hard scales. The semiorbicular lobules on the margins at the base of the lip, and the stigma with irregular lobulated margin were also taken into consideration.

Calanthe brevicornu Lindley: Tuyama in Fl. E. Himal. **2**: 179 (1971).

NEPAL. Bhalukhop–Chitre, 2400 m (Jun. 5, 1972); Mewa Khola, 2100 m (Jun. 29, 1972).

June 5-specimen was collected on a rather dark ground in *Castanopsis-Symplocos* forest with an undergrowth of *Mahonia* and *Viburnum* (fide Dr. Ohashi). At Mewa Khola, eastern Nepal, this was found scattered under a *Schima Wallichii* forest in the deep shade place (fide Dr. Kanai).

Calanthe Mannii Hooker: Fl. E. Himal. **2**: 180 (1971).

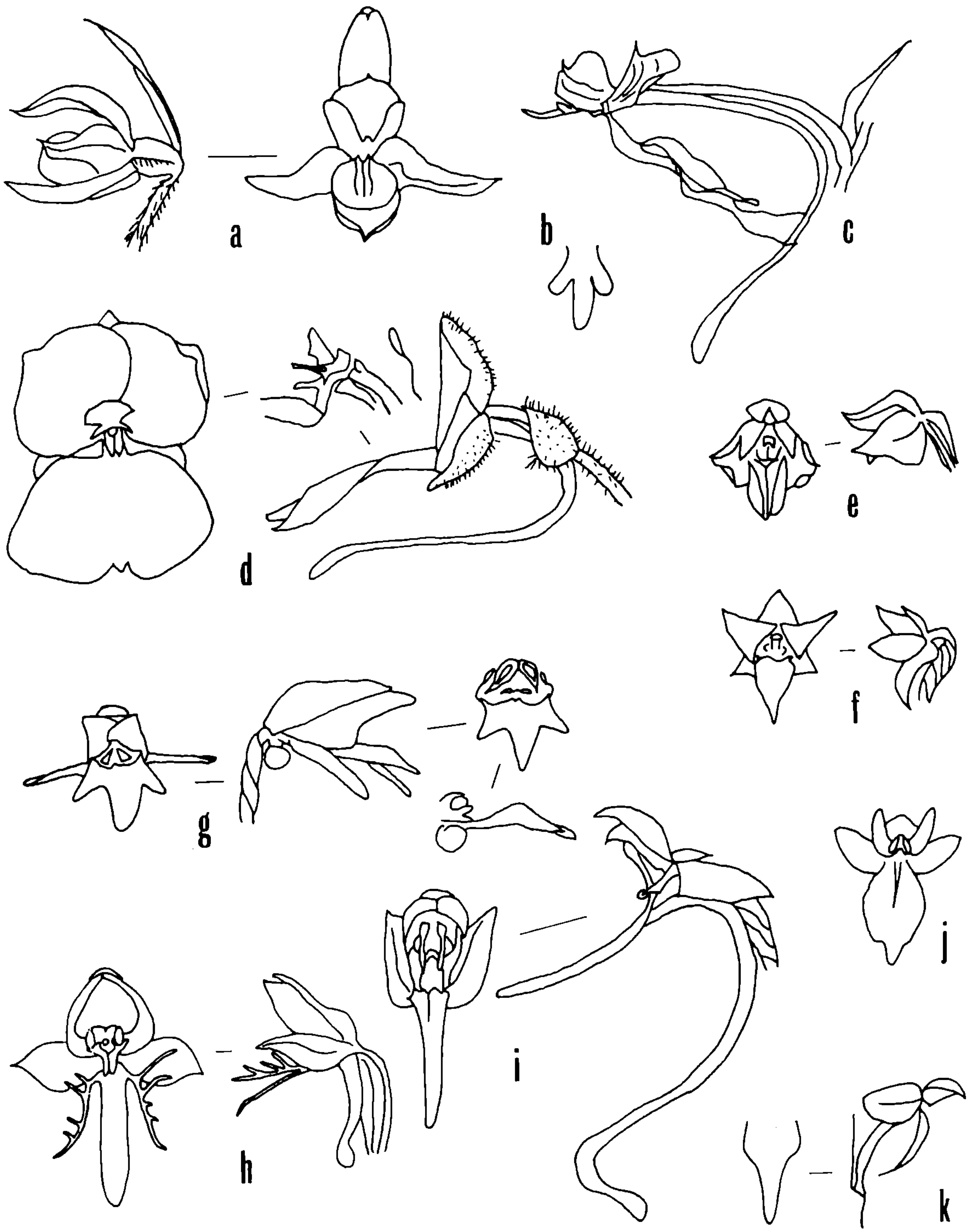

Fig. 15. Various Himalayan Orchids (1). Dr. Kanai's field sketches at the place of collection. Redrawn by Miss K. Nishikawa. All the figures were originally drawn in various size to represent the natural posture. a. *Cypripedium elegans*, b. *Habenaria fallax*, c. *H. commelinifolia*, d. *Diplomeris hirsuta*, e. *Goodyera repens*, f. *Herminium congestum*, g. *Habenaria goodyeroides*, h. *H. pectinata*, i. *H. arcuata*, j. *Herminium Josephii*, and k. *H. pugioniforme*.

NEPAL. Bilbatay Bhanjyang–Hati Surde, 2400–2900 m (Oct. 27, 1963); Helok–Iladanda, 1800 m (Nov. 8, 1963); Birwa–Yektin, 2800 m (Nov. 28, 1963); Chitre–Basantapur, 2400 m (Jun. 6, 1972); Shewadan–Mewa Khola, 2600–2100 m (Jun. 29, 1972).

According to Dr. Ohashi's photograph taken on 6 June, the flower does not open widely in the full-blossom. The sepals and petals are brownish, the lip is yellow becoming paler towards the side-lobes, and the spur greenish.

Calanthe puberula Lindley, Gen. Sp. Orch. 252 (1833)–Hook. f., Fl. Brit. Ind. 5: 848 (1890)–King et Pantl., Orch. Sikkim. 166, t. 224 (1898).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972); Palmajua–Batasi, 2200–2100 m (Aug. 8, 1972).

These specimens were collected under a *Castanopsis* forest on the fairly dark ground (fide Dr. Kanai). In additions to these, living plant was cultivated to bloom by Dr. Hara at Karuizawa of Central Honshu, side by side with the Japanese *Calanthe reflexa.* This Himalayan species closely resembles the Japanese *Calanthe reflexa* not only in general appearance but also in floral structure. These two species have well-fascicled leaves with the short petioles being hidden in between. The Himalayan plant differs from the Japanese in the following: Tepals not strongly reflexed, basal part of the midlobe of the lip broader, and the anterior side dentation of the column not so prominent compared with the Japanese. In addition, in the Japanese plant the column is wider in front view than the Himalayan and often has small but prominent hooks on both sides at the top of the column anteriorly. Some of these features distinguishing the two species were already pointed out by Schlechter in 1916.

Calanthe tricarinata Lindley: Fl. E. Himal. **2**: 180 (1971).

NEPAL. Tinjure–Dor, 2900–2600 m (Jul. 6, 1972).

The flower of this plant is fairy variable and the above-mentioned specimen has the tepals light green, with the lip reddish brown. The midlobe of the lip is thinly margined with white, and the basal part of it iucluding side-lobes is pure white except for the apical part of the side-lobes, which are tinged with brownish spots or dots. The ridges on the lip are also variable. In this plant, the ridges are three in number; they are thickly callose, depressedly undulating with many obtuse lobulated heads. Compare with that of figs. a and b in Pl. 8 of Hara: Fl. E. Himal. second rep. (1971), where the said ridges are plate-like and prominent.

Calanthe trulliformis King et Pantling in Journ. Asiat. Soc. Beng. **64**: 337, t. 2 (1895); Orch. Sikkim. 168, t. 226 (1898). [Plate 7e]

NEPAL. Dor–Chitre, 2600–2300 m (Jul. 7, 1972).

DARJEELING. Below Raman, 2400 m (Aug. 4, 1972).

Distr. Temperate Himalaya (E. Nepal to Sikkim).

This plant seems rather rare in the Himalayan region. Flowers are directed horizontally or a little nodding. The spur is less than 2 mm long, and is not cylindric but dorsiventrally compressed, the apex being truncately subbilobed. The lip is narrowly trowel-shaped or often like the shape of a violin with the narrowed portion in the middle, the margins being irregularly undululate and often involuted at the subapical part. The lip is white as a whole, but at the base between the ridges it is brownish yellow. Sepals and petals are brown, greenish yellow between the nerves and the margins and at the apex. Spur is white.

King and Pantling say that this plant is allied to *Calanthe puberula*, but no convincing evidence can be found in their explanation. They say that the leaves are sessile, but in our specimen in full blossom those are apparently long-petioled.

Coelogyne corymbosa Lindley: Fl. E. Himal. 428 (1966); **2**: 181 (1971).

NEPAL. Chitre–Tute, 2400–2300 m (Jun. 6, 1972); Dor, 2600 m (Jun. 7, 1972); Lamo Pokhari, 2900 m (Jun. 9, 1972); Bhorlang–Sundarijar, 2400–1400 m (Aug. 31, 1972).

Cryptochilus lutea Lindley: Fl. E. Himal. 430 (1966).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972).

Cypripedium elegans Reichenbach f. in Flora **69**: 561 (1886)–Fl. Brit. Ind. **6**: 169 (1890)–King et Pantl., Orch. Sikkim. 341, t. 446 (1898)–Kränzl., Orch. Gen. Sp. **1**: 29 (1897). [Plate 7c]

NEPAL. Topke Gola, 3600 m (Jun. 17, 1972).

Distr. E. Nepal, Sikkim, and E. Tibet.

This was collected only once by us during our several expeditions to E. Himalaya. J. D. Hooker's and King and Pantling's descriptions are based on a single specimen that was collected by Pantling at Lacen Valley, alt. 10,000 ft. We were lucky enough to have six plants, all with good flowers. The place of collection was among the mosses in a low formation of procumbent juniper and willow spp. The plant was sporadically scattered. According to Dr. Kanai's field note, and photographs, the tepals are all pale green, except the basal part striped with pale purple. The saccate lip has three prominent ridges in front. According to the description and the figure of King and Pantling, the colour of the flower is brownish with darker lines of the same colour. The hair on the peduncle is villous and if not artificially disturbed by pressing it is retrosely directed. King and Pantling describe that the height of the entire plant does not exceed four inches (ca. 10 cm). Our plants are between 6 and 15 cm, each bearing one flower. Detailed description and affinity of this plant will be given later.

Dendrobium chrysanthum Wallich ex Lindley: Fl. E. Himal. **2**: 184 (1971).

DARJEELING. Lodhoma Khola, 1500 m (Aug. 6, 1972, on rocks).

Dendrobium eriaeflorum Griffith: Fl. E. Himal. 432 (1966); **2**: 184 (1971).

NEPAL. Sim Chotala, 900 m (Aug. 19, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

King and Pantling say that Khasia Hill specimens are invariably smaller than those of Sikkim. In my sudy, the size of the flowers is varies considerably even in the same collection. For example; the largest and the smallest flowers of the cited specimen measured as follows; the largest flower has a dorsal sepal 9.5 mm long, and the epichile of the lip as long as the former. Here the measurement was made as they are in natural posture, i.e. curved or convex parts are not spread artificially when measured. In the smallest flowers, the dorsal sepal and the epichile are 7.0 mm and 7.5 mm long, respectively.

Dendrobium Pierardi Roxburgh: Fl. E. Himal. 433 (1966); **2**: 185 (1971).

NEPAL. Sanguri Bhanjyang, 1200 m (Jun. 2, 1972, epiphytic on the trunk of *Schima Wallichii*).

According to Dr. Kanai's field note, corolla is white, the lip yellow with the slightest nuance of light green nerved with purple inside becoming suddenly rose purple at the base.

Dendrobium porphyrochilum Lindley: Fl. E. Himal. 433 (1966); **2**: 185 (1971).

Nepal. Godawari–Phulchoki, 2100–3000 m (May 29, 1969, no. 69827); Phulchoki, 2700 m (Jun. 10, 1969, no. 726217); Sim Chotala, 900 m (Aug. 19, 1972).

Flowers are dirty greenish yellow, with the lip dark purplish (Dr. Hara's field note). In this species the size of the flowers is quite variable. The variability, perhaps, depends on soil condition or some other circumstantial conditions. At first, I paid attention to the small-flowered specimen no. 726217. Comparison of size was made between this specimen and no. 69827. The method of measurement was the same as in the case of *Dendrobium eriaeflorum*. In no. 69827 and no. 726217, the petal measured 7.0 mm and 5.5 mm, the epichile 5.5 mm and 4.5 mm in the fully expanded flower. In the other specimens collected, however, there are intermediate sizes due to individual differences, and no local differentiation is found in this respect.

Diplomeris hirsuta Lindley, Gen. Sp. Orch. 330 (1835)–Hook. f., Fl. Brit. Ind. **6**: 167 (1890)–King et Pantl., Orch. Sikkim. 337, t. 443 (1898)–Kränzl., Orch. Gen. Sp. **1**: 471 (1898). [Plate 7a, b]

Diplochilos hirsutum Lindley [in Wall. Cat. no. 7065 (1832), nom. nud.] in Bot. Rey. sub. t. 1499 (1832).

Nepal. Sim Chotala, 900 m (Aug. 19 & 20, 1972). On mossy rocks along the brooklets in sunny places near villages. Flowers are white with a faint yellow centre, that is the column, the basal parts of tepals including the lip are tinged with light yellow. The spur is cylindrical recurving slightly to the anterior side, attaining to 4.5–5.0 cm in length. (It is described by J. D. Hooker as 1.5 inch (ca. 3.8 mm) long).

Distr. Tropical Himalaya (Nepal, Sikkim to Bhutan).

According to the transparencies made by the members of the expedition, oral information and Dr. Kanai's field note, the flower is pure white with the slightest nuance of yellow in the centre. J. D. Hooker states that the tuber is globose; in our dried specimen, however, it is fusiform and about 1 cm long. The spur is longer than described by J. D. Hooker (1.5 inch long), actually attaining 5.0–5.5 cm, which is incurved forwards slightly and then pendulous. A small schematic reconstruction of the flower is shown in my figures. These are based on the slides and a rough sketch made at the place of collection by Dr. Kanai. According to Dr. Hara, there is only one type collection by Wallich in several larger herbaria in the United Kingdom, and our area of collection in C. Nepal mentioned above is believed to be the second following Wallich, so far as Nepal is concerned. According to the members of the 1972 expedition, the area of this plant was very small and was estimated to be less than 2 square meters. They refrained from collecting extra specimens so as not to disturb the natural habitat.

In Dr. A. D. Hookes: Encyclopedia of Cultivated Orchids, p. 174 (1965), there is a description of non-cultivated orchids, that reads as follows: "Four species of *Diplomeris* are known to date, but unfortunately none of them seems to be present in contemporary collections, though they are among the more unique of terrestrial orchids. A member of the subtribe Habenarinae, these plants are all inhabitants of the mountains of North India and China, where they typically grow on exposed

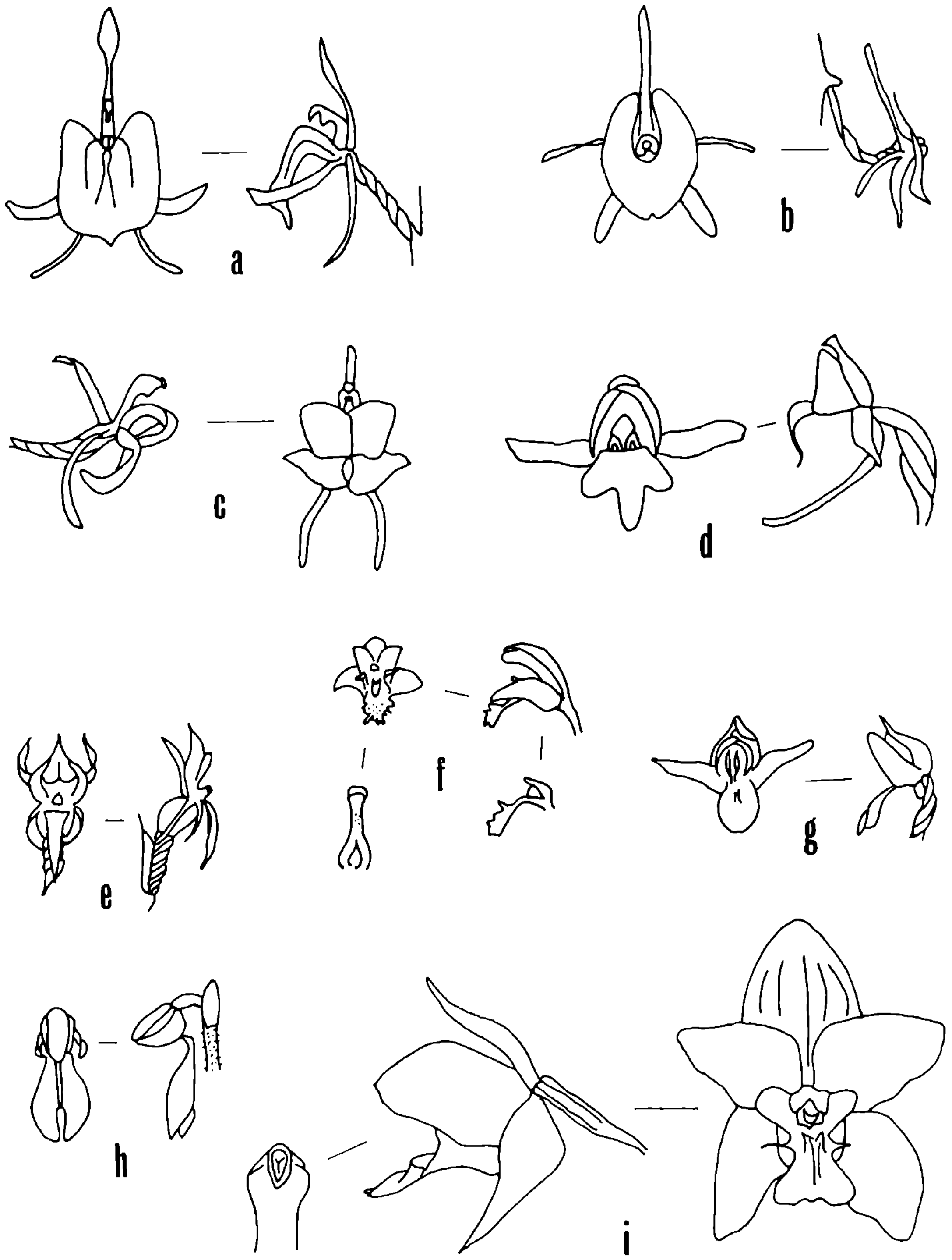

Fig. 16. Various Himalayan Orchids. (2). Dr. Kanai's field sketches at the place of collection. a. *Liparis Glossula,* b. *Malaxis acuminata,* c. *Liparis nervosa,* d. *Orchis habenarioides* alliance from Langtang, Nepal (This species is not studied yet and are deleted from the enumeration of Tuyama), e. *Malaxis muscifera,* f. *Oreorchis micrantha,* g. *Orchis spathulata,* h. *Listera pinetorum,* i. *Spathoglottis ixioides.*

rock-outcroppings. They bear large, roundish leaves, these prostrate on the substratum, and erect, one-flowered inflorescences. The flowers are typically of considerable size, great intricacy of structure, and unique beauty. Nothing is known of the genetic ties of this charming and neglected genus."

Further study will be published in the separate paper.

Epipactis Helleborine (Linnaeus) Crantz, Stirp. Austr. 467 (1769), emend. Watson et Coulter in Asa Gray, Manual ed. 6, 504 (1890)–Mansf. in Fedde, Repert. **45**: 238 (1938).

Serapis Helleborine Linnaeus, Sp. Pl. ed. 1, 949 (1753).

Epipactis latifolia (Hudson) Allioni, Fl. Ped. Mont. **2**: 151 (1785)–Hook. f., Fl. Brit. Ind. **6**: 125 (1890).

NEPAL. Above Dunche–Gosainkund, 2065–3000 m (Jun. 4, 1969, sterile); Singum Gompa, 3200 m (Aug. 22, 1972, old flowers).

Distr. N. Africa, Europe, temperate Himalaya (Kashmir, Nepal, Sikkim), and N. Asia.

This is what Hooker f. recognized as *E. latifolia* Swarts in his Flora on page 125 (1890). Only two collections were examined; one is a single sterile plant, the other includes two plants with old flowers.

Sir J. D. Hooker states in his Flora var. *intrusa* Hook. f. from Sikkim, alt. 11,000 ft. (probably at Gnatong) that it is 'very slender, leaves few, small, flowers few very distant, epichile without calli'. According to Lindley this specimen n. 232 is mixed with *E. latifolia.* Our specimens appear to be so-called typical *latifolia.* In a moistened old flower specimen from Signum Gompa, a couple of prominent calli are found on both sides of the midrib two-thirds downwards of the whole length of the epichile from the apex. I can say nothing taxonomically on these specimens. King and Pantling mentioned on the erose edge on the epichile, which I have failed to find.

Eria dasyphylla Parish et Reichenbach f. in Trans. Linn. Soc. **30**: 147 (1874)–Hook. f., Fl. Brit. Ind. **5**: 808 (1890)–Seidenf. et Smitinand, Orch. Thail. 285, f. 213 (1960).

NEPAL. Siwanta–Tsinging, 850–1000 m (Apr. 23, 1969, on the bark of a tree).

Distr. Tropical Himalaya (Nepal, Sikkim), Burma, Thailand, and Laos.

Our flowers are too old to permit minute dissection. The resultant structures I could have seen are not contradictory to the descriptions of this species, made by J. D. Hooker and others. Determination was mainly dependent on the vegetative appearances. J. D. Hooker says that the floral bracts under a flower are cupular, while the description and figures of King et Pantling and those of Seidenfaden et Smitinand show that they are lanceolate. In my observation, the uppermost bract is often cupular with or without indistinct laminar apex. Bracts of lower level transformed to unilaterally elongated sheath-like shape attaining finally to sheathed bracts provided with distinct laminar portion, which is often exserting the cupulate bract.

Eria muscicola Lindley: Fl. E. Himal. 434 (1966).

NEPAL. Papung–Bir Gaon, 2000–1600 m (Jun. 30, 1972).

Eulophia herbacea Lindley, Gen. Sp. Orch. 182 (1833)–Dalz. et Gibs., Bomb.

Fl. 265 (1861)–Hook. f., Fl. Brit. Ind. **6**: 2 (1890)–Duthie in Ann. Bot. Gard. Calc. **9**: 123, t. 106 (1906).

NEPAL. Shyaprubensi–Tangjet, 1500–1800 (Jun. 27 & Jul. 9, 1970).

Distr. Garwhal, Nepal, Koncan, and Bengal.

Our specimen and Dr. Kanai's photograph of the flower agree in every detail with the description and the figure given by Duthie. The sepals are green and the lip and petals are white.

The specimens were collected on narrow ridge line under a *Pinus Griffithii*-forest with *Habenaria intermedia*.

Gastrochilus distichus (Lindley) O. Kuntze: Fl. E. Himal. 435 (1966); **2**: 187 (1971).

NEPAL. Hile–Chitre, 1900–2400 m (Jun. 5, 1972).

Gastrodia Dyeriana King et Pantling in Journ. Asiat. Soc. Beng. **64**: 342 (1895); Orch. Sikkim. 259, t. 345 (1898). [Plate 7d]

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972).

Distr. Sikkim.

Only one specimen was met with by a path which penetrates an evergreen oak forest. Stems 62 cm high, including floriferous spike attaining 16.5 cm, bearing 17 bracts.

Judging from the specimen and photographs, it seems that the basal portion of the flower tube is first disorganized and drops off from the rest of the flower, leaving the weakened column on the ovary. Refer to Fig. 18, a–d. This is quite the same condition as I have observed in *Gastrodia nipponica* and *G. confusa* in Japan.

Geodorum purpureum R. Brown in Aiton, Hort. Kew. ed. 2, **5**: 207 (1813)–Hook. f., Fl. Brit. Ind. **6**: 16 (1890)–King et Pantl., Orch. Sikkim. 181, t. 245 (1898)–? Seidenf. et Smitin., Orch. Thail. 472, fig. 350, pl. 20 (1961).

NEPAL. Dingla, 1000 m (Jul. 2, 1972).

Distr. Ceylon, tropical Himalaya (Nepal eastward to Bhutan), Bengal, Assam, Burma, and ?Thailand.

The unicate specimen was collected under the sparse forest. Unfortunately, however, the flowers were a little too early in the flowering season for correct determination. A better flower was dissected and examined under the microscope. A lateral sepal is 1.3 cm long, and a petal examined seemed to be 1.0 cm long. A lip pressed right laterally was examined. It is as long as the petal. The lip is gradually ventricose in the lower half, with the margins rather regularly repand through all its margins with acute sinus. The column is short and thick, about 3.5 mm long and 2.0 mm thick, with a dentate apex and a couple of protuberances on the subapical anterior margins, the anther already having dropped off.

Drs. Seidenfaden and Smitinand on page 475 of the literature cited above tentatively divided the *Goedorum* alliance of Thailand into 2 groups, i.e. one group that flowers in April to June having less developed vegetative parts, with the petioles of the leaves still hidden, and an other group that flowers mainly in July to August, with the petioles at the time of flowering being quite long and free of the sheaths. According to their classification, our plant belongs apparently

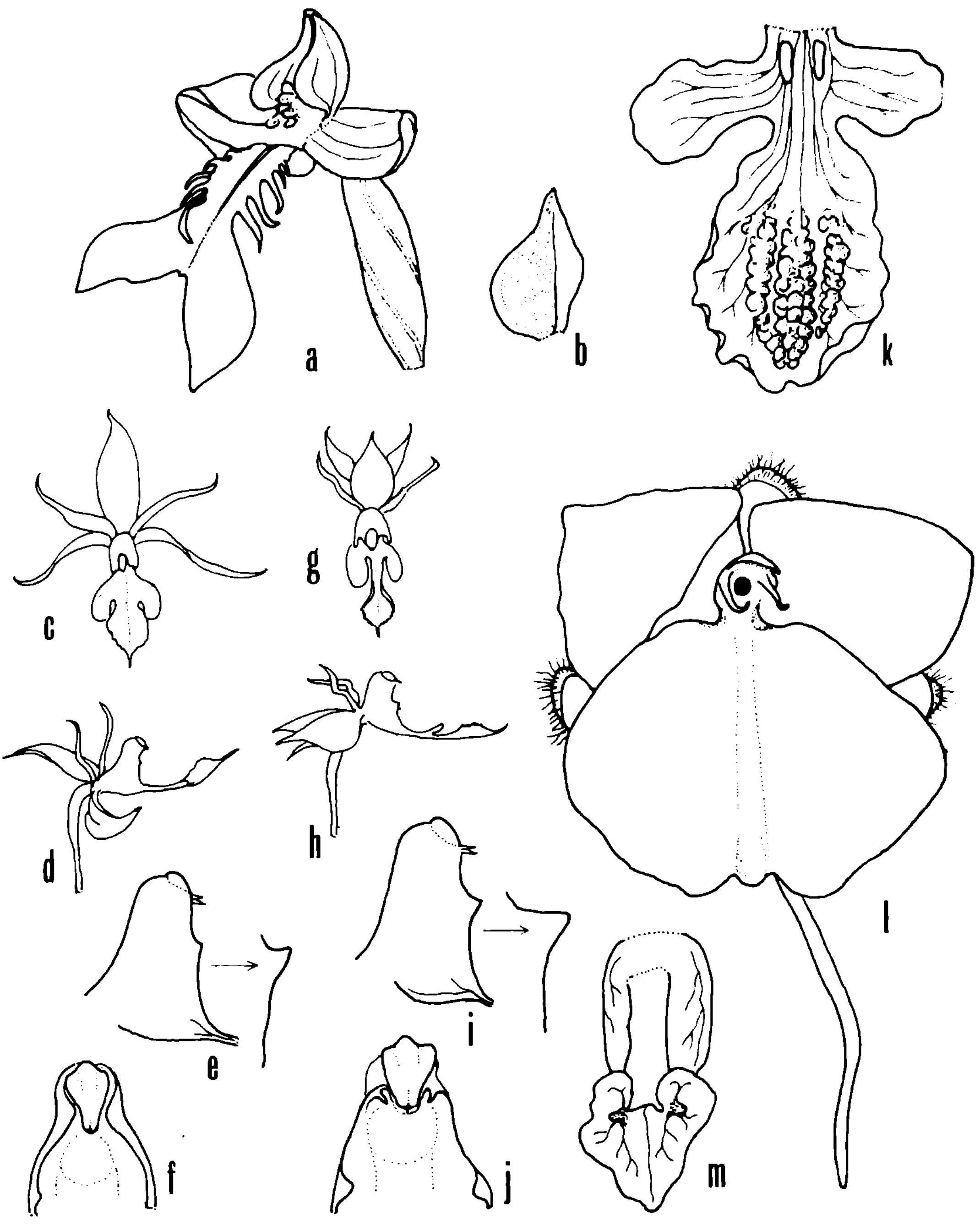

Fig. 17. Himalayan Orchid Flowers* (1). a,b. *Anoectochilus lanceolatus* (Simkuna, Aug. 10, 1972). a. Flower, oblique anterior view, ×ca. 2, b. Petal, ×ca. 2. c–f. *Calanthe puberula* (Palmajua, Aug. 7, 1972). c, d. Flowers, anterior and lateral views, ×ca. 1. e, f. Columns, lateral and anterior views, ×ca. 2. g–j. *Calanthe reflexa* (Japanese plant). g, h. Flowers, anterior and lateral views, ×ca. 1. i, j. Columns, lateral and anterior views, ×ca. 2.5. k. *Calanthe tricarinata* (Tinjure–Dor, Jul. 6, 1972). Lip, spread out, ×ca. 2. l. *Diplomeris hirsuta* (Sim Chotala, Aug. 19 & 20, 1972). Flower, anterior view, ×ca. 1.8. m. *Epipactis Helleborine* (Singum Gompa, Aug. 22, 1972). Lip, ×ca. 5.7.

(c–j. fresh materials, l, m. from a transparency of Dr. Hara).

*If not otherwise mentioned, all the sketches included in Figs. 17–22 are drawn from moistened specimens. Hence in many instances, the posture of the flowers illustrated here is artificial.

to the first group. My determination is tentative, and so is the distribution mentioned above.

Goodyera Hemsleyana King et Pantling in Journ. Asiat. Soc. Beng. **65**: 342 (1895); Orch. Sikkim. 281, t. 373 (1898).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972, ster., cultivated and flowered, pressed on Jul. 29 & 30, 1974).

Distr. Sikkim.

This was actually collected by Prof. Hara, and carefully brought back to Japan. Cultivation was made at Karuizawa, Central Honshu, by him. It began to flower from the middle of July, 1974. Examination was made on the fresh flower (Fig. 18, f–n). It well matches King and Pantling's description and figure. Leaves are distinctly reticulated with white. The sepals reddish brown outside covered by thick erect hair that is multicellular. The dorsal sepal oblong-lanceolate, obtuse at the apex, 3-nerved, and the lateral sepals similar but a little oblique. The petals translucently white, narrowly rhombeo-oblong, angustate on both ends unequal cohering to the dorsal sepal to make a hood. The apical part of the lip seems a little constricted in the flower examined.

Goodyera repens (Linnaeus) R. Brown: Fl. E. Himal. 436 (1966).

NEPAL. Phulchoki, 2000–2770 m (May 29, 1969, ster.–flowered on Jul. 30, 1974; Aug. 9, 1969); Tsedang Pokhari–Dobate, 3000–3230 m (Aug. 23, 1969); Thale Bisauna–Tingoang, 3000 m (Sep. 11, 1970); Tingoang–Khosori Khabre, 3000 m (Sep. 12, 1970); Thulo Tingsang–Tingsang, 3200–2900 m (Sep. 25, 1970); Lamo Pokhari, 2900 m (Jun. 9, 1972, ster.–flowered on Jul. 30, 1974); Chauke–Dor, 2900 m (Jul. 6, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Hile Dhap–Mangen, 3100 m (Aug. 27, 1972); Mangen–Khodang Danda, 3100–2500 m (Aug. 28, 1972).

In my statement on this plant in 1966, I have discussed variation in the hairiness of the scapes and sepals on one plant which was the only one collected by us at that time. Several dozens of specimens were thereafter collected from the many localities listed above. On examination of these, hairiness on the scape and sepals is found general feature of this species in the Himalayan region as is found in plant of Japan and its neibouring area. The degree of hairiness is due to individual variation. In the Himalayan plants, there are often more densely hairy individuals as compared with the average Japanese plants. Hence, there is no basis to separate the Himalayan plant such as subsp. *marginata* Kitamura. Dr. Maekawa proposed a new variety name for the Himalayan plants on page 465 of his elaborate work on the Japanese orchids, The Wild Orchids of Japan in Color, 1971, because he assumed that they usually have glabrous scapes. This newly proposed name, however, cannot be tenable because of the fact explained above and also it is not in accordance with the International Code. It is noteworthy that the Himalayan plant has in many cases larger, thicker leaves, and the spike (floriferous part of the stem) attains to 17 cm in length, and as more densely flowered. In the Japanese plants, the length of the spike commonly ranges between 2 and 5 cm. Dr. Hara has cultivated the long-spiked form of Himalaya at Karuizawa which borne flowers quite the same in size and structure as of the common Japanese form, but this still retained the Himalayan features explained above.

In dissecting the dried Himalayan *Goodyera repens* specimen, I noticed 4 longitudinal callosities among the 5 main nerves at the base of the saccate part of the lip. These, on examination of the living Himalayan plant, proved to be small longitudinal ridges arising abruptly and gradually attenuating downwards. These are also observed in the all Eastern Asiatic specimens I have examined, and seem to have been overlooked by the earlier authors.

Scape 22 cm long, spike 10.7 cm long, retrorsely hairy on the scape and the spike. Pilosity on the sepals is poor, but there are some hairs mainly on the lateral sepals.

Habenaria[1] (§ Hologlossa) **arcuata** (Lindley) Hooker f.: Fl. E. Himal. **2**: 188 (1971).

NEPAL. Phulchoki, 2700 m (Jun. 10, 1969; Jun. 10 & 20, 1970); Yatumbal-Oo Kharka, 2700–3400 m (Jun. 30, 1970).

Additional specimens were found in abundance. Further comparison with the Japanese *Habenaria japonica* will be published in a separate paper. This was collected sporadically in the calcareous area on the humus under a sparse evergreen forest.

Habenaria (§ Platyglossa) **arienata** Hooker f.: Fl. E. Himal. **2**: 188 (1971).

H. pectinata D. Don var. *arienata* Kränzlin, Orch. Gen. Sp. **1**: 405 (1898).

NEPAL. Baroya Khimty, 2500 m (Nov. 11, 1963, old fls.); Bhorlang–Pati Bhanjyang, 2300–1750 m (Aug. 21, 1967); Dunche, 1900 m (Aug. 22, 1969).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, 3600–2100 m (Aug. 4, 1972); Raman–Rimbick, 2400–1900 m (Aug. 5, 1972); Palmajua–Batasi, 2200–2100 m (Aug. 8, 1972); Darjeeling–Lopchu, 2200–800 m (Aug. 12, 1972).

Flowers greenish. The habitat is the sunny grassy slope with the exposed rocks scattered thereabout with few stands of *Quercus semecarpifolia*.

Habenaria (§ Hologlossa) **Bakeriana** King et Pantling: Fl. E. Himal. **2**: 189 (1971).

NEPAL. Tsedang Pokhari–Panghu Danda, 3600 m (Aug. 23, 1969); Mul Kharka–Yatumbal, 3200 m (Jul. 7, 1970); Nessum–Bhuje, 1300–2700 m (Jul. 3, 1972); Bhuje–Chauke, 2700–2900 m (Jul. 4, 1972); Chauke–Dor, 2900–2600 m (Jul. 6, 1972); Tinjure, 2900 m (Jul. 6, 1972).

DARJEELING. Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972); Phalut, 3600 m (Aug. 3, 1972).

Habenaria (§ Hologlossa) **Biermanniana** King et Pantling in Journ. Asiat. Soc. Beng. **64**: 343 (1895); Orch. Sikkim. 318, t. 419 (1898).

Platanthera Biermanniana (King et Pantling) Kränzl., Orch. Gen. Sp. **1**: 636 (1899).

NEPAL. Minchin Dhap–Mul Pokhari, 2500 m (Oct. 29, 1963); Baroya Khimty–Thakma Khola, 3200 m (Nov. 12, 1963); Ingyur–Tsedang Pokhari, 2100–3000 m (Aug. 22, 1969).

Distr. Temperate Himalaya (C. Nepal and Sikkim).

Characteristics of this species in the dried condition are that the whole plant

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[1] In treating *Habenaria* and its allied genera, I have included *Platanthera*, *Peristylis*, etc. under the genus *Habenaria*, as the delimitation between these genera is not convincing.

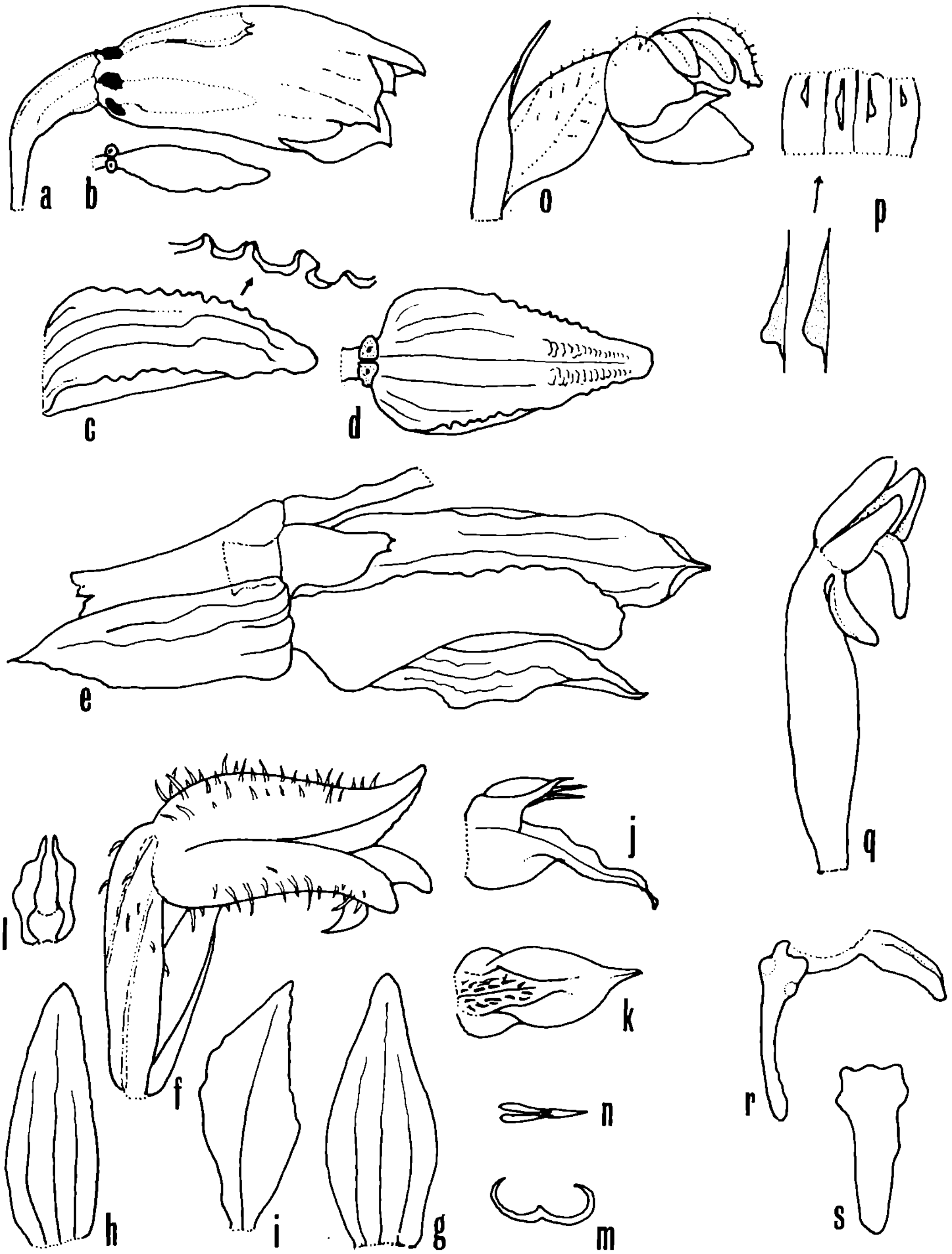

Fig. 18. Himalayan Orchid Flowers (2). a–d. *Gastrodia Dyeriana* (Palmajua, Aug. 7, 1972). a. Flower, lateral view with column and lip seen through flower-tube, ×ca. 5.5, b. Lip, slightly deformed, ×ca. 5.5, c, d. Lips, oblique lateral and upper views, with the basal portion cut off, ×ca. 11, e. *Geodorum purpureum* (Dingla, Jul. 2, 1972). Flower, dorsal sepal and one of the petals are partly broken, ×ca. 4.3. f–n. *Goodyera Hemsleyana* (Palmajua, Aug. 7, 1972). f. Flower with bract, g, h. Sepals, dorsal and lateral views, i. Petal, j. Lip and column, lateral view, k. Lip, upper view, l. Column, upper view, with the anther taken out, m. Hypochile, transection, ×ca. 8, n. Pollinium, f–l & n ×ca. 6.5. o, p. *Goodyera repens* (Phulchoki, May 29, 1969). o. Flower, with bract, ×ca. 6, p. Lower portion of hypochile, with thin lamellae between the nerves, ×ca. 12. q–s. *Habenaria Biermanniana* (Ingyur–Tsedang Pokhari, Aug. 22, 1969). q. Flower, ×ca. 4.8, r. Lip with spur, s. Lip, anterior view, r–s ×ca. 6.2.

becomes blackish, and the scape is hardened, which is thick when alive as compared with the similar species. The leaves are thick in texture and chartaceous when dry. A remarkable feature of this species is the expanded part of the leaf-blade, which is comparatively smaller than the rest of the leaf, i.e., the vaginating or amplexicaul part of the basal part of lamina and the petiole. The flowers on the specimen are too old for minute examination, but the rough sketches were made. As to the shape of the lip, King and Pantling say "lip fleshy, much decurved, linear oblong, tapering slightly to the obtuse apex, with minute and tooth-like side lobes; spur as long as the lip, curved subclavate, dorsally compressed". In this concern, Dr. Kränzlin says that the lip (he erroneously writes "Die Petalen") has on the outersides a suggestion of anterior division in the shape of an obtuse triangle. He could not examine the specimen, but had a chance to see the plate of King and Pantling. In my observation "the triangle" is a somewhat amorphous outgrowth directed obliquely upwards from the margin of the lip.

Habenaria (§ Trimeroglossa) **commelinifolia** Wallich [Cat. no. 7037 (1832), nom. nud.] ex Lindley, Gen. Sp. Orch. 325 (1835)–Hook. f., Fl. Brit. Ind. **6**: 143 (1890)–Kränzl. in Engler, Bot. Jahrb. **16**: 137 (1893); Orch. Gen. Sp. **1**: 322 (1898), ut *commelynifolia*–Duthie in Ann. Bot. Gard. Calc. **9**: 183, t. 134 (1906)–Gagnepain et Guillaumin in Lecomte, Fl. Gen. Indochine **6**: 612 (1934)–Seidenf. et Smitin., Orch. Thail. 41, fig. 31 (1959).

Orchis commelinifolia Roxburg, Fl. Ind. ed. 2, **3**: 451 (1832).

Platanthera commelinifolia Lindley [in Wall., Cat. no. 7037 (1832), nom. nud.] ex Kränzlin, l.c. 322 (1898), ut *commelinaefolia.*

NEPAL. Betrawati–Sim Chotala, 900 m (Aug. 19, 1972).

Distr. Tropical W. Himalaya (Simla, Kumaon, Garhwal, C. Nepal), Peninsular India (Konkan, Kanar), Upper Burma, Thailand, and Cochinchina.

It seems rather rare in Nepal.

Habenaria (§ Hologlossa) **densa** Wallich ex Lindley: Fl. E. Himal. 437 (1966); **2**: 189 (1971).

NEPAL. Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972).

DARJEELING. East Side, 2100 m (Jul. 23, 1972); Phalut–Raman, 3600–2100 m (Aug. 4, 1972).

This species is perhaps one of the most commonly distributed *Habenaria* throughout the whole area we have botanized during 1960 to 1972. By the photograph taken by Dr. Kanai between Phalut and Raman the natural posture of the flower was confirmed. The beaked portion of the ovary is gradually incurved with its apex directed stright downwards, hence the hood consists of the dorsal sepal and the petals that are pointed horizontally. The lateral sepals are strongly reflexed and incurved with their apices close together. The lip is directed downwards or a little reflexed backwards. The spur is cylindric or a little narrowed to the base and suddenly ending in an obtuse apex, directed backwards and slightly arcuated in alignment with the beak of the ovary. These postures are somewhat different from that of King and Pantling's specimen. In the dried specimen or even in a boiled specimen, the narrowed portion of the spur is often too much emphasized as compared with the fresh material.

Habenaria (§ Platyglossa) **dentata** (Swartz) Schlechter: Fl. E. Himal. 437 (1966).

NEPAL. Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Habenaria (§ Hologlossa) **Elizabethae** Duthie in Journ. Asiat. Soc. Beng. **71** (2): 44(1902); in Ann. Bot. Gard. Calc. **9**: 191, t. 143 (1906)–Collett, Fl. Siml. 505 (1902); ed. 2, 505 (1921).

NEPAL. Bilbatay Bhanjyang–Hati Surde, 2400–2900 m (Oct. 27, 1963); Hati Surde–Minchin Dhap, 2600–2900 m (Oct. 28, 1963); Minchin Dhap–Mul Pokhari, 2500 m (Oct. 29, 1963); Tsedang Pokhari–Dobate, 3000–3230 m (Aug. 23, 1969); Khanging–Langtang Gorge, 2600 m (Jul. 11, 1970); Thale Bisauna–Tingoang, 2750–3100 m (Sep. 11, 1970).

DARJEELING. Phalut–Raman, 3600–2400 m (Aug. 4, 1972).

Distr. Temperate Himalaya (Garhwal, Simla to Darjeeling).

The plant is slender with commonly two leaves, which are lanceolate in shape and rather thin in texture. The small flowers are well spaced on the strict spike, and the floral bracts are shorter than the ovary. At a glance, the bracts are not conspicuous. The small spur is slightly grooved longitudinally on both anterior and posterior surfaces throughout. The shape of the lip seems to be considerably variable as shown in Fig. 19.

Habenaria (§ Peristylis) **fallax** (Lindley) King et Pantling, Orch. Sikkim. 325, t. 428 (1898).

Peristylis fallax Lindley, Gen. Sp. Orch. 298 (1835)–Kränzl., Orch. Gen. Sp. **1**: 512 (1898).

Herminium fallax Lindley [in Wallich. Cat. no. 7412 (1832), nom. nud.] ex Hook. f., Fl. Brit. Ind. **6**: 129 (1890); Icon. Pl. t. 2198 (1894).

NEPAL. Bilbatay Bhanjyang–Hati Surde, 2400–2900 m (Oct. 27, 1963); Langtang Gorge–Langtang, 3400 m (Jul. 12, 1970); Tinjure, 2900 m (Jul. 6, 1972).

Distr. Temperate Himalaya (Kumaon to Sikkim).

The plant has one leaf only, and the spike is very densely flowered with the exserting floral bracts giving the very distinct appearance specific to this kind. The densely flowered nature of this plant is seen in J. D. Hooker's figure, where the floral bracts are rather smaller than our plants. As to the shape of the lip, D. J. Hooker says very variable. In this respect refer to Fig. 19.

J. D. Hooker says that the spike of this species is densely or sparcely flowered. Ours are among the former, while the one figured by Pantling is of the latter, with the bracts shorter than or equaling the ovary as is described and figured by King. In these respects King and Pantling's plant might have been the extreme form.

Habenaria (§ Peristylis) **goodyeroides** D. Don: Fl. E. Himal. 438 (1966).

NEPAL. Tangjet–Shyaprubensi, 2240–1500 m (Jul. 9, 1970); Bir Gaon–Dingla, 1600–1000 m (Jul. 1, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

According to King and Pantling, flowers are white or creamy, and the sepals are tinged with brown. According to Dr. Kanai, the flower is pale greenish yellow, spotted with dirty brown at the base of the lip, and the spur being translucent. Dr. Hara's field note reads that the flower is light ochraceous yellow, or dirty yellowish white. Under the microscope, petals are thicker in texture as of the lip,

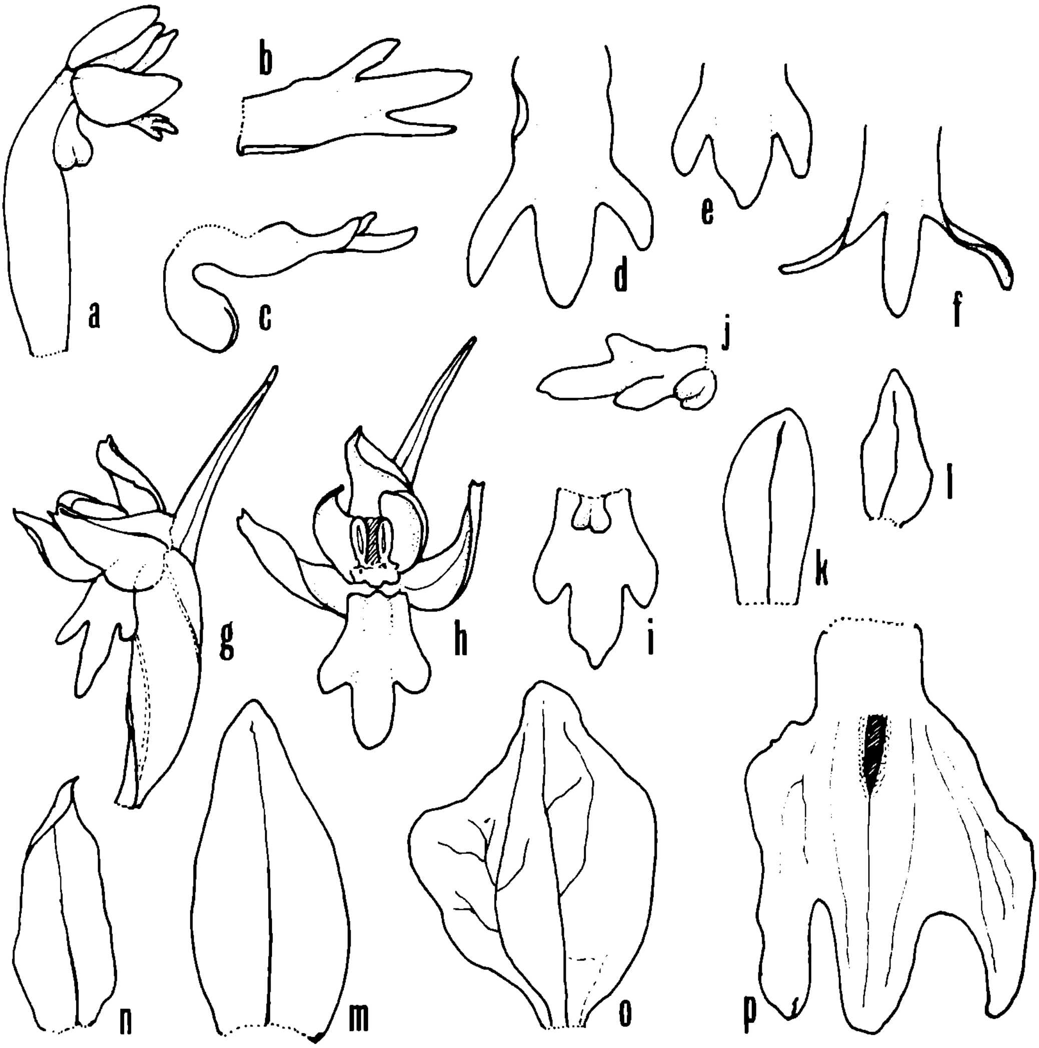

Fig. 19. Himalayan Orchid Flowers (3). a–f. *Habenaria Elizabethae* (a: Khanging-Langtang Gorge, Jul. 11, 1970). a. Flower, lateral view, ×4, b. Lip, upper oblique view, ×ca. 14, c. Lip, lateral view, ×ca. 10, d–f. Lips, upper portions, ×ca. 14. g–l. *Habenaria fallax* (Tinjure, Jul. 6, 1972). g, h. Flowers, oblique anterior and anterior views, i, j. Lips, oblique upper and upper views, k. Dorsal sepal, l. Petal, g–l ×ca. 6. m–p. *Habenaria goodyeroides* (Sim Chotala–Gram, Aug. 20, 1972). m. Dorsal sepal, n. Lateral sepal, o. Petal, p. Lip, m–p ×ca. 16.

and they are celluloso-papillose, and especially more so as to the lip. The size of the flower is variable. For example, the dorsal sepals of the fully expanded flowers from two plants collected in different localities are 5.7, 4.7, and 4.0 mm respectively. Persistently, however, there are always low and thin convergent calli in a parallel pair at the base of the lip, and a longitudinal depression in between. In our collection, I could not find *Habenaria goodyeroides* var. *affinis* (D. Don) King et Pantling, l.c. 327, t. 430-bis (1898), ut var. *affinis* L. [=*Habenaria affinis* D. Don, Prodr. Fl. Nepal. 25 (1825)].

In D. Don's Obs. (Observation) of *Habenaria affinis* we read "Praecedenti (*H. goodyeroides*) valde sait (ut sit) affinis; sed omnibus partibus triplo minor," and Lindley's var. β (syn. *Habenaria affinis* Don) is followed by 'floribus minoribus, spicis foliisq. brevioribus'.

In their key to Sikkimese species of *Habenaria*, King and Pantling says that "Lip . . . with a horizontally oblong collum near its base . . .". The last description is apparently their addition of new characters given to the variety. Dealing with the *Habenaria goodyeroides* group, I have never seen any such horizontal calli.

Habenaria (§ Platyglossa) **intermedia** D. Don, Prodr. Fl. Nepal. 24 (1825)–Lindl., Gen. Sp. Orch. 322 (1835)–Hook. f., Fl. Brit. Ind. **6**: 138 (1890); in Ann. Bot. Gard. Calc. **5**: 65, sub *H. arienata* (1895)–Kränzl., Orch. Gen. Sp. **1**: 403 (1898); in Engler, Bot. Jahrb. **16**: 191 (1900)–Duthie in Ann. Bot. Gard. Calc. **9**: 180, t. 131 (1906).

NEPAL. Shyaprubensi–Tangjet, 2200 m (Jun. 27, 1970).

Distr. Temperate Himalaya (Kashmir, Kumaon, Nepal) and Khasia Hills.

J. D. Hooker cited Sikkim as a locality of this orchid, but Duthie says that there are no records of the species from the area.

The specimen was collected under a *Pinus Griffithii*-forest on the ridge line on the slightly shaded ground.

Habenaria (§ Hologlossa) **juncea** King et Pantling: Fl. E. Himal. **2**: 189 (1971).

DARJEELING. Phalut–Sandakphu, 3300–3970 m (Jul. 19, 1969); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972); Phalut, 3600 m (Aug. 3, 1972); Phalut–Raman, 3600–2100 m (Aug. 4, 1972.)

In addition to 1969-collection, we have collected ample specimens around the same locality. Except for the first cited specimen, which is provided with two leaves, with the leaf-blade stouter than others, with the acute apex, and with the length of the lamina being 5 and 2.5 cm long respectively, all the otherplants are slender attaining 9 to 22 cm high with one leaves elliptic to broadly oblong, rounded at the apex with the lamina 1.5–5.0 cm long. King and Pantling's plant is 12 inches (about 30 cm) high, with the solitary leaves 1.5–2.5 inches (3.8–6.4 cm) long, subacute at the apex.

Habenaria (§ Hologlossa) **latilabris** (Lindley) Hooker f.: Fl. E. Himal. 438 (1966); **2**: 189 (1971).

NEPAL. Barabise–Thale, 2000 m (Sep. 9, 1970); Chauke–Dor, 2900–2600 m (Jul. 6, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1970); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

There are variations in hairiness on the sepals due to individual differences. In some instances, the specimen seems to be almost glabrous under the lens. It revealed to be a matter of degree, when examined under microscope. Refer to plate 9 of this volume.

Habenaria (§ Hologlossa) **nematocaulon** Hooker f., Fl. Brit. Ind. **6**: 154 (1890)–King et Pantling, Orch. Sikkim. 316, t. 416 (1898).

Platanthera nematocaulon (Hooker f.) Kränzlin, Orch. Gen. Sp. **1**: 942 (1901).

DARJEELING. Tonglu–Sandakphu, 1800–3600 m (Jul. 31, 1972).

Distr. Alpine Himalaya (Darjeeling, Sikkim).

Only one collection including 4 plants is in my hands. They are very small and slender plants attaining to 14–22 cm in height. One leaf is borne 4–5 cm above the tuber, with the leaf-blade narrowly and linearly oblong, subacute at the apex. Above this leaf, 2–4 small leaves with the leaf-blades less than 1 cm are expanding horizontally, gradually becoming smaller and intergrading into the bracts. The spike is short, 1.5–3.0 cm long, densely and secondly flowered. Floral bracts are equal to or shorter than the ovary. The lateral sepals and the petals adnate to the base of the lip.

Habenaria (§ Phyllostachya) **obcordata** (Buch.-Ham. ex D. Don) Fyson, Fl. Nilg. & Puln. Hill-Tops **1**: 405, t. 258 (1915).

Orchis obcordata Buch.-Ham. ex D. Don., Prodr. Fl. Nepal. (1825).

Gymnadenia obcordata (Buch.-Ham. ex D. Don) Reichb. f., Otia **2**: 32 (1869).

Phyllomphax obcordata (Buch.-Ham. ex D. Don) Schlechter in Fedde, Repert. Beih. **4**: 119 (1919)–Fyson, Fl. S. Ind. Stat. **2**: 594, t. 528 (1932).

Nepal. Tangjet–Shyaprubensi, 1750–2240 m (Jul. 9, 1970); Shyaprubensi–Dunche, 1500–2000 m (Jul. 19, 1970).

Distr. Temperate Himalaya (Kumaon, Nepal).

Wallich Catalogue no. 7050 includes three plants, i.e. Wallich's own collection, a specimen from Hort. Bot. Calc., and R. Blinkworth's. These three show good match with our specimens cited above. This species belongs to a very unique plant group as explained by J. D. Hooker in his Fl. Brit. Ind. **6**: 132 (1890). I have, however, no idea yet on the generic seggregation of this group of plants from *Habenaria* or *Platanthera* as has been done by Schlechter.

Habenaria (§ Platyglossa) **pectinata** D. Don, Prodr. Fl. Nepal. 24 (1825)–Lindl., Gen. Sp. Orch. 321 (1835)–Hook. f., Fl. Brit. Ind. **6**: 137 (1890)–King et Pantl., Orch. Sikkim. 310, t. 406 (1898)–Kränzl., Orch. Gen. Sp. **1**: 405 (1898); in Engler, Bot. Jahrb. **16**: 192 (1900).

Nepal. Shyaprubensi–Khanging, 1500–2300 m (Jul. 10, 1970); Shyaprubensi–Dunche, 1500–2000 m (Jul. 19, 1970); Shewaden–Papung, 2600–2000 m (Jun. 29, 1972); Papung–Bir Gaon, 2000–1600 m (Jun. 30, 1972); Gram–Thale, 1900 m (Aug. 21, 1972); Dunche–Singum Gompa, 2200–3200 m (Aug. 22, 1972).

Distr. Temperate Himalaya (Simla, Nepal, Sikkim) and Khasia.

There are views that *Habenaria arienata* can not be separable from *Habenaria pectinata* as a distinct species. Already in 1890, in his Flora of British India **6**: 138 under the entry of *Habenaria arienata*, J. D. Hooker states as follows: So similar in a dried state to *H. pectinata* as to be with difficulty distinguishable, and though separated by Lindley, perhaps only a variety. Both species are similar in becoming blackish when dry, whole stature of plant, the large and broad floral bracts, size and form of the flower including those of the lip and in addition almost the same general appearance. Lateral sepals similarly strongly curved backward. King and Pantling say, in their diagnostic key to these two species, that in the former species, *Habenaria pectinata*, the petals are not dilated at the base on the outer side, and is not pubescent on the inner side. According to them, in *Habenaria arienata* the case is contrary. My observation on the distinctness of the species is as follows. In *Habenaria pectinata*, the flowers are more congested, while in *Habenaria arienata* they are well spaced on the same growth condition. In addition, the hood formed by the cohesion of the dorsal sepal and the petals is kept only for a short time after unfolding, in sharp contrast to *Habenaria arienata* which retains its hood until to shortly before the withering. In the former, the petals and sepals are green with the lip a little lighter in colour and its segments thicker than the former and in addition the spur is a little exceeding, equalling, or being shorter than the ovary. In the latter, however, tepals are pale greenish white, the lip is paler coloured, its segments are thinner and filamentous, and the spur is long exceeding the ovary. King and Pantling describe that the leaves are linear-lanceolate and acuminate in the former, and they are narrowly elliptic in the latter. Actually, however, the range of variation is overlapping each other in both species, and the distinction between the two is not so sharp in this respect. The place of collection at Gram–Thale is a grassland with the surviving small patch of *Pinus Roxburghii*, and that at Dunche–Singum Gompa is the abandoned paddy field owing to the land slide. The Dunche–Singum Gompa specimen is pubescent on the inner side of the petal. This kind of specimen might have been taken as a intergrading form between *Habenaria pectinata* and *H. arienata* by the botanist who could not examine the plant alive, and might gave them a basis to treat one as a variety of the other. From all the explanation given above, however, such a treatment cannot be tenable.

Habenaria (§ Dipyla) **secundiflora** Hooker f., Fl. Brit. Ind. **6**: 165 (1890); Icon. Pl. t. 2321 (1895)–King et Pantl., Orch. Sikkim. 330, t. 433 (1898).

Peristylis secundiflorus (Hooker f.) Kränzlin, Orch. Gen. Sp. **1**: 518 (1898).

NEPAL. Phulchoki, 2400–2700 m (Sep. 19, 1970).

Distr. Subalpine Himalaya (Kumaon, Nepal, Sikkim, Bhutan) and S. Tibet (Chumbi).

Habenaria (§ Hologlossa) **sikkimensis** Hooker f., Fl. Brit. Ind. **6**: 155 (1890)–King et Pantl., Orch. Sikkim. 317, t. 417 (1898).

Platanthera sikkimensis (Hook. f.) Kränzl., Orch. Gen. Sp. **1**: 621 (1898).

NEPAL. Hati Surde–Minchin Dhap, 2600–2900 m (Oct. 28, 1963); Dor–Chauke, 2600–2900 m (Jun. 7, 1972).

Kränzlin says, this species is remarkable for its foliaceous, large, recurving floral bracts.

Habenaria (§ Hologlossa) **stenantha** Hooker f., Fl. Brit. Ind. **6**: 153 (1890)–King et Pantl., Orch. Sikkim. 314, t. 412 (1898).

NEPAL. Hati Surde–Minchin Dhap, 2600–2900 m (Oct. 28, 1963); Minchin Dhap–Mul Pokhari, 2600 m (Oct. 29, 1963); Siling Tzokupa, 2100 m (Nov. 21, 1963).

DARJEELING. Palmajua-Batasi, 2200–2100 m (Aug. 8, 1972).

Kränzlin includes this species under *H. latilabris* (Lindl.) Hook. f. (Orch. Gen. Sp. **1**: 442, 1898), but it can not be tenable.

On examination of Dr. Hara's photograph at Thale Patil, alt. 3400 m on Aug. 27, 1972, the natural posture of the flower and its parts were clarified. The ovary with its beaked part strongly arcuate as a whole with the apex pointing downwards often keeping its apex lower than the place of insertion of the flower. Hence the floral bract which is shorter than the ovary is pressed under the curved ovary.

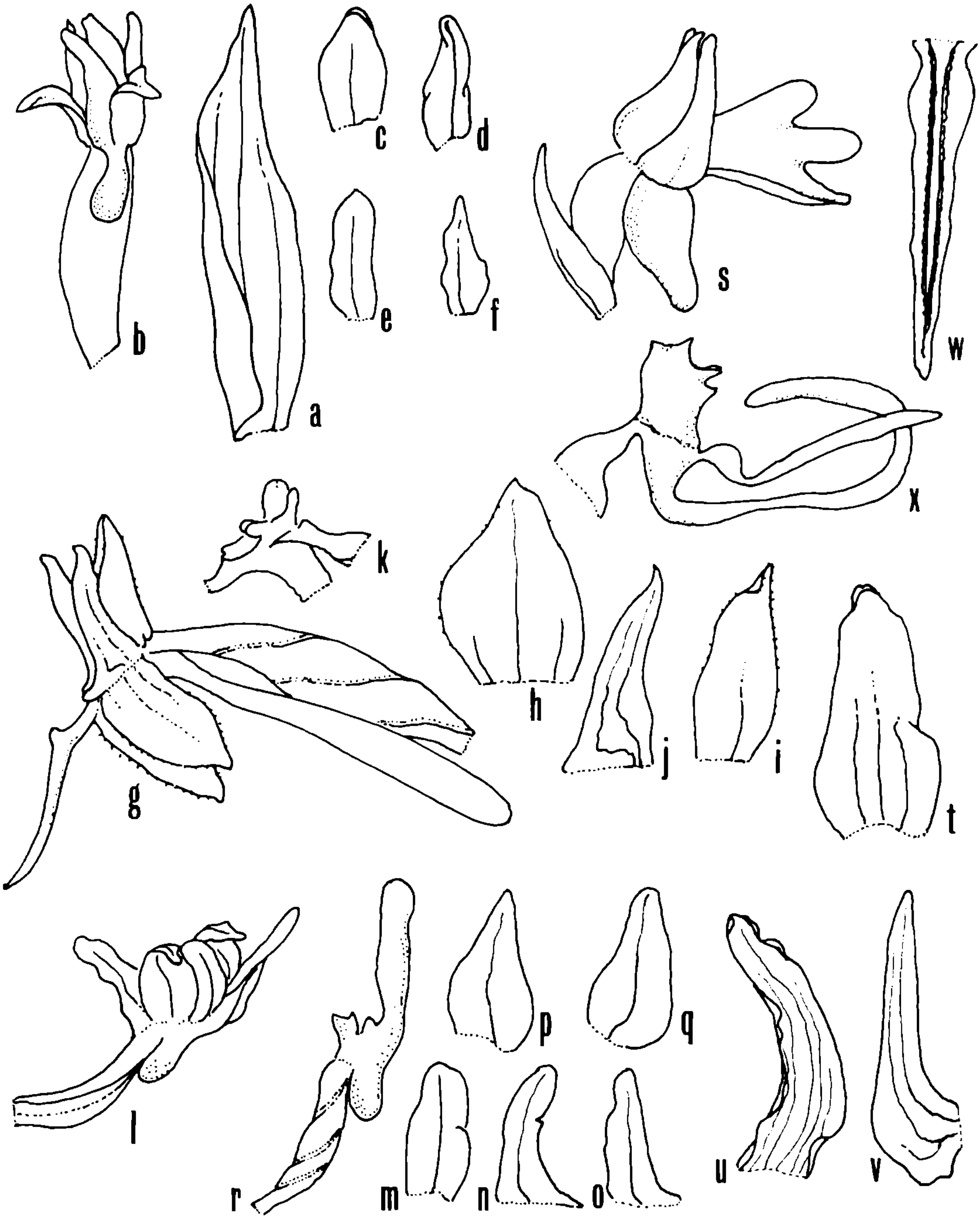

Fig. 20. Himalayan Orchid Flowers (4). a–f. *Habenaria juncea* (Phalut–Sandakphu, Jul. 19, 1969). a. Bract, b. Flower, oblique ventral view, c. Dorsal sepal, d, e. Lateral sepals, f. Petal, a–f × ca. 6. g–k. *Habenaria latilabris* (Sandakphu–Phalut, Aug. 2, 1972), g. Flower, oblique ventral view, h. Dorsal sepal, i. Lateral sepal, j. Petal, k. Column with portions of ovary, lip, and spur, g–k × ca. 5. l–r. *Habenaria nematocaulon* (Tonglu–Sandakphu, Jul. 31, 1972), l. Flower, lateral view, m. Dorsal sepal, n, o. Lateral sepals, p, q. Petals, r. Flower without sepals and petals, l–r × ca. 5.5. s. *Habenaria secundiflora* (Phulchoki, Sep. 19, 1970). Flower with bract, lateral view, × ca. 6, t–x. *Habenaria sikkimensis* (Hati Surde–Minchin Dhap, Oct. 28, 1963). t. Dorsal sepal, u. Lateral sepal, v. Petal, w. Lip, spread out, x. Column with lip, spur, and upper portion of ovary, t–x × ca. 6.

The dorsal sepal forms the hood with the petals pointing horizontally or a little downwards. The lateral sepals are deflexed backwards. The flat lip is straight and suddenly bent obliquely downwards. The spur is cylindrical pointing to the back straight and horizontally, or often slightly recurving downwards, its apex being quite obtuse. In the dried condition the spur is narrowed half way of the total length. There are a couple of lamellate calli on both sides of the midvein of the lip, as is to be seen in my figure.

Habenaria (§ Ate) **stenopetala** Lindley: Fl. E. Himal. 439 (1966)–Hook. f. in Ann. Bot. Gard. Calc. **5**: 177 (1895)–Kränzl., Orch. Gen. Sp. **1**: 358 (1898)–Duthie in Ann. Bot. Gard. Calc. **9**: 63, t. 95 (1906)–Withner, Orchids 133, pl. 48, f. 22 (1959).

NEPAL. Ghatte–Khebang, 2400–1700 m (Nov. 19, 1963); Phulchoki, 1600 m (Sep. 6, 1972).

The Ghatte–Khebang specimen seems, in the moistened condition, to have very thin petals, and the nerves on it are conspicuous. This may be due to the drying condition. This species is said to be very commonly distributed throughout the India. The stature of the whole plant and the size of the flower is said to be very variable. Kränzlin says that var. *polytricha* Hook. f. in Ann. Bot. Gard. Calc. **5**: 64, t. 96 (1895), which 'has the all tepals including the lip are drown out (ausgezögen) into the capllary ends', is the extreme form of the typical one, and that every possible transitional form occurs. According to the field note of Dr. Kanai, the flower observed at Phulchoki is white with a slight nuance of green. Natural posture of the flower is shown by Dr. Kanai's sketch.

Herminium congestum Lindley [in Wallich, Cat. no. 7068 (1832), nom. nud.] Gen. Sp. Orch. 305 (1835); in Journ. Linn. Soc. **3**: 43 (1859)–Hook. f., Fl. Brit. Ind. **6**: 130 (1890)–King et Pantl., Orch. Sikkim. 335, t. 440 (1898)–Kränzl., Orch. Gen. Sp. **1**: 930 (1901)–Duthie in Ann. Bot. Gard. Calc. **9**: 199 (1906).

NEPAL. Bhuspate Danra, 2800 m (Dec. 2, 1963, flowered at Shinjuku Gyoen Park, Tokyo on Apr. 26, 1964); Langtang Gorge–Langtang, 2800–3400 m (Jul. 12, 1970); Topke Gola, 3700 m (Jun. 18 & 19, 1972); Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972).

DARJEELING. Sandakphu, 3790–3800 m (Jul. 15, 1969); Sandakphu, 3600 m (Jul. 16, 1969); Sandakphu–Phalut, 3600-3200 m (Aug. 2, 1972); Phalut–Raman, 3600-2100 m (Aug. 4, 1972).

BHUTAN. Tremo La–Chek, 4000 m (K. Nishioka, Jun. 23, 1966).

Distr. Alpine Himalaya (Baltistan, Kumaon, Nepal, Sikkim to Bhutan).

Herminium Josephii Reichenbach f. in Flora **54**: 276 (1872), ut *Josephi*–Hook. f., Fl. Brit. Ind. **6**: 129 (1890)–King et Pantl., Orch. Sikkim. 335, t. 441 (1898)–Kränzl., Orch. Gen. Sp. **1**: 534 (1898).

NEPAL. Langtang Gorge–Langtang, 2800–3400 m (Aug. 12, 1970).

Distr. Subalpine Himalaya (C. Nepal, Sikkim, Bhutan).

At present, the above-mentioned locality is the easternmost outpost of this species. Leaves 2–3, linearly oblanceolate, the scape naked. Against the description of King et Pantling, the lip is yellow green except the longitudinally ridged portion coloured with green (fide Dr. Kanai). The two ridges are located on both sides of and very near to the midrib extending from the base, attaining to half the total length of the lip, with converging apieces.

Herminium lanceum (Thunberg) Vuijk: Fl. E. Himal. **2**: 190 (1971).

NEPAL. Sundarijar–Bhorlang, 1400–2400 m (Aug. 20, 1969; Aug. 31, 1972); Sim Chotala-Gram, 900–1900 m (Aug. 20, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1970); Dunche-Singum Gompa, 1900–3000 m (Aug. 22, 1972).

DARJEELING. Phalut–Raman, 3600–2100 m (Aug. 4, 1972); Raman–Rimbick, 2400–2200 m (Aug. 5, 1972); Rimbick–Palmajua, 2200 m (Aug. 6, 1972); Palmajua–Batasi, 2200–2100 m (Aug. 8, 1972); Batasi–Mani Bhanjyang, 2100–2000 m (Aug. 9, 1972).

Perhaps one of the most commonly distributing species among the tribe Basitonae in the Himalayan region.

Herminium monophylla (D. Don) Hunt et Summerhayes in Kew Bull. **20**: 51 (1966).

Neottia monophylla D. Don, Prodr. Fl. Nepal. 27 (1825).

Herminium gramineum Lindley [in Wallich, Cat. no. 7413 (1832), nom. nud.] Gen. Sp. Orch. 305 (1835); in Royle, Ill. Bot. Himal. Mount. 370, t. 87, f. 3 (1835)–Hook. f., Fl. Brit. Ind. **6**: 131 (1890)–Kränzl., Orch. Gen. Sp. **1**: 535 (1898).

NEPAL. Barabise–Thale, 800–2000 m (Sep. 9, 1970).

Distr. Subtropical Himalaya (Kumaon, Garhwal, Nepal).

This specimen is much smaller than the commonly described form. It is only 3.3–5.0 cm high with one leaf that is linear and strongly recurving, and with hyaline sheath under the leaf.

Herminium pugioniforme Lindley ex Hooker f.: Fl. E. Himal. **2**: 190 (1971).

NEPAL. Thale Patil–Rock Shelter II, 3270–3220 m (Aug. 24, 1969); Oo Kharka–Mul Kharka, 3400–3800 m (Jul. 1, 1970); Mul Kharka, 3800 m (Jul. 3, 1970).

DARJEELING. Sandakphu, 3500 m (Aug. 1, 1972); Sandakphu–Phalut, 3300 m (Aug. 2, 1972).

Distr. Subalpine Himalaya (Kashmir, Garhwal, Nepal, Darjeeling, Sikkim).

Dr. Kanai gives a sketch at the place of collection for Mul Kharka plant, which shows the sepals deflexed from the base backwards. In my observation of the lip, the deflexed anterior portion of the lip has a couple of sinuses in its basal edge. I am not sure that these correspond to what King and Pantling call 'deep oval parallel pits'. The colour of the flower is green (fide Dr. Kanai).

Herminium quinquelobum King et Pantling in Journ. Asiat. Soc. Beng. **65**: 130 (1896); Orch. Sikkim. 332, t. 435 (1898)–Kränzl., Orch. Gen. Sp. **1**: 930 (1901).

Herminium fallax Hook. f. sensu Tuyama in Fl. E. Himal. 440 (1966).

NEPAL. Minchin Dhap–Mul Pokhari, 2900–2500 m (Oct. 29, 1963); Mul Pokhari–Dumhan, 2500–700 m (Oct. 30, 1963).

Distr. Temperate Himalaya (Nepal, Darjeeling, Sikkim).

As Hooker f. and Kränzlin already pointed out, this looks, in general appearance, like *Herminium lanceum* (Thunb.) Vuijk (=*H. angustifolium* Benth). In the former, however, the ovaries are strict and standing up closely pressed to the axis of the spike, while in the latter they are spread out.

Ione scariosa (Lindley) King et Pantling, Orch. Sikkim. 161, t. 219 (1898).

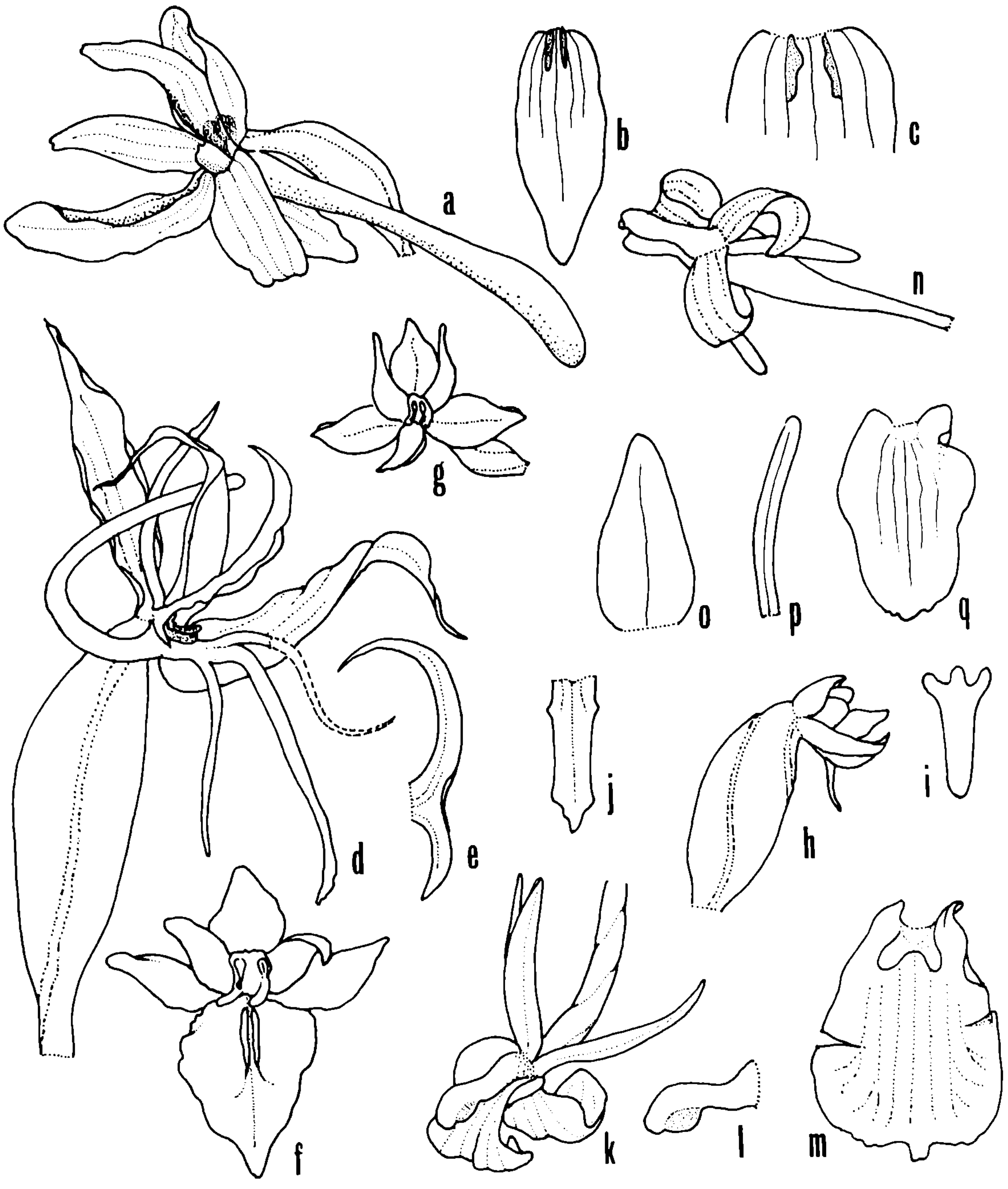

Fig. 21. Himalayan Orchid Flowers (5). a–c. *Habenaria stenantha* (Palmajua–Batasi, Aug. 8, 1972). a. Flower, ×3, b. Lip, ×ca. 3, c. Basal part of lip explanded, ×ca. 6. d, e. *Habenaria stenopetala* (Ghatte–Khebang, Nov. 19, 1963). d. Flower, with the side lobe of lip lost, ×ca. 2.8, e. Petal, ×ca. 2.8. f. *Herminium Josephii* (Langtang Gorge–Langtang, Jul. 12, 1970). Flower, anterior view, ×ca. 3.5. g. *Herminium monophylla* (Barabise–Thale, Sep. 9, 1970). Flower, anterior oblique view, ×ca. 7.3. h, i. *Herminium pugioniforme* (Thale Patil–Rock Shelter II, Aug. 24, 1969). h. Flower, side view, ×ca. 3.5, i. Lip, anterior pendulous portion, ×ca. 18. j. *Herminium quinquelobum* (Minchin Dhap–Mul Pokhari, Oct. 29, 1963). Lip, ×ca. 18. k–m. *Liparis nervosa* (Shyaprubensi–Khanging, Jul. 10, 1970). k. Flower, upper oblique view, l. Column, side view, k–l ×ca. 3, m. Lip, spread out, ×ca. 5.5. n–q. *Liparis pusilla* (Chauke–Lamo Pokhari, Jun. 8, 1972). n. Flower, ×ca. 10.5, o. Lateral sepal, p. Petal, q. Lip, spread out, o–p ×ca. 12.

Sunipia scariosa Lindley [in Wallich Cat. no. 7373 (1832), nom. nud.] Gen. Sp. Orch. 179 (1833); Fol. Orch. Sunipia 1 (1853)–Hook. f., Fl. Brit. Ind. **5**: 772 (1890).

NEPAL. Bhuktani–Sukaura, 1250–450 m (Jan. 8, 1970).

Distr. Subtropical Himalaya (Nepal, Sikkim, Bhutan), Khasia, and Burma (Tennaserim).

This unicate specimen was found on the trunk of *Schima Wallichii*. General appearance matches well with the description of J. D. Hooker, King & Pantling and the other botanists, but the petals are ovate and entire, blunt at the apex, and are not roundish nor erose-denticulate.

Liparis Glossula Reichenbach f. in Linnaea **41**: 44 (1877)–Ridley in Journ. Linn. Soc. **22**: 268 (1886)–Hook. f., Fl. Brit. Ind. **5**: 693 (1890)–King et Pantl., Orch. Sikkim. 26, t. 32 (1898).

NEPAL. Langtang Gorge–Langtang, 3200 m (Jul. 12, 1970).

Distr. Subalpine Himalaya (Kumaon, Garhwar, Nepal, Sikkim).

Only four plants were collected in a open grassland. According to Dr. Kanai's field note, the petals are linear, purple, the lip being dull brownish purple. Under the microscope the margin of the lip is papillose, and the papillae are blunt in the apices, unicellular or sometimes bicellular with the basal cell very short.

Liparis nervosa (Thunberg) Lindley, Gen. Sp. Orch. 26 (1830).

Ophrys nervosa Thunberg, Fl. Jap. 27 (1784).

Malaxis odorata Willdenow, Sp. Pl. **4**: 51 (1805).

Empusa paradoxa Lindl. [in Wallich, Cat. no. 1937 (1832), nom. nud., pro parte] in Bot. Reg. sub t. 825 (1824).

Liparis odorata (Willdenow) Lindley, Gen. Sp. Orch. 26 (1830)–Thwaites, Enum. Pl. Ceyl. 426 (1864)–Ohwi, Fl. Jap. 378 (1953); ed. rev. 441 (1965); ed. Engl. 347 (1965)–Kitamura, Murata et Koyama, Colour. Ill. Herb. Pl. Jap. **3** (Monocot.): 50, t. 12, f. 87 (1967)–Maekawa, Wild Orch. Jap. 320, t. 123 (1971).

Liparis paradoxa (Lindley) Reichenbach f. in Walp., Ann. **6**: 218 (1861)–Ridl. in Journ. Linn. Soc. **22**: 261 (1886)–Hook. f., Fl. Brit. Ind. **5**: 697 (1890)–King et Pantl., Orch. Sikkim. 27, t. 34 (1898).

NEPAL. Shyaprubensi–Khanging, 1500–2300 m (Jul. 10, 1970).

Distr. Temperate and subtropical Himalaya (Kumaon, Nepal, Sikkim), Khasia, Naga Hills, Peninsular India, Ceylon, Burma, Thailand, Indo-China, Java, and S. China to Japan.

Only two plants in full blossom were collected. In my observation on the boiled flower, the dorsal sepal is enrolled inside out and obliquely directed backwards. The petals are deflexed and straightly pointing to the back. Lateral sepals are recurved. The lip is dark purple (fide Dr. Kanai), suddenly recurved a little below the middle of the lamina with its apex slightly emarginated and again truncately cuspidate at the apex. Two thickly clavate calli are produced from the base of the lip in a parallel position which adnate each other at their bases and if they are spread out horizontally, an obtuse sinus is formed between them. The calli of the same nature are found in the Japanese specimen. The column is manifestly winged below the apex along the incurved portion.

Liparis perpusilla Hook. f.: Fl. E. Himal. **2**: 190 (1971).

NEPAL. Chauke–Lamo Pokhari, 2600–2900 m (Jun. 8, 1972).

Only the young floral shoots with bulbs were collected in the mat of moss. This may be the easternmost output of the species.

Liparis petiolata (D. Don) Hunt et Summerhayes: Fl. E. Himal. **2**: 190 (1971).

NEPAL. Chitre–Tute, 2400–2300 m (Jun. 6, 1972).

Liparis pusilla Ridley in Journ. Linn. Soc. **22**: 294 (1886)–Hook. f., Icon. Pl. 1856 A (1889); Fl. Brit. Ind. **5**: 701 (1890)–King et Pantl., Orch. Sikkim 32, t. 41 (1898).

Liparis Duthiei Hook. f. sensu Tuyama in Fl. E. Himal. **2**: 190 (1971).

DARJEELING. Batasi–Mani Bhanjyang, 2100–2000 m (Aug. 9, 1972).

SIKKIM. Gangtok, Orchid Sanctuary, 1700 m (Jun. 27, 1969).

Distr. Temperate Himalaya (Kumaon, Nepal, Darjeeling, and Sikkim) and Khasia.

In my 1971 report of Himalayan orchids incorporated in the preceding report of this, I have carelessly misidentified the Gangtok specimen. Similarity of these two species gives no excuse to me. J. D. Hooker says that the bract is one-fourth inch long in Icon. Pl. This is too long a measure for this plant. Hooker later says it is one-tenth inch long in his Flora of British India. This size has the good match with my plant. Ridley in his original description of this species gives a line, "bracteae . . . 1/2–2/3 pedicellorum aequales; . . .". His measure is too small for my plant in comparison with the pedicel. J. D. Hooker states in his Flora that the lip is 2-auriculate, but I have failed to find any such structure in my plant. The size of the flower given by J. D. Hooker is a little too large for my plant. As there are some ambiguities, the identification given here should be still tentative.

Listera pinetorum Lindley in Journ. Linn. Soc. **1**: 175 (1857)–Hook. f., Fl. Brit. Ind. **6**: 104 (1890)–King et Pantl., Orch. Sikkim. 256, t. 338 (1898).

NEPAL. Lamo Pokhari, 2900 m (Jun. 9, 1972).

DARJEELING. Phalut–Raman, 3600–2100 m (Aug. 4, 1972).

Distr. Subalpine and temperate Himalaya (Nepal, Darjeeling, Sikkim, Bhutan) and Tibet (Chumbi).

This species was originally collected in a pine wood in Lachen Valley of Sikkim, hence the name came. The size of the tepals in our specimens is somewhat different from those given by J. D. Hooker and King & Pantling, but the measure may fall in the range of specific variation. Dr. Kitamura reported this species from Tolo Gomba Khola of C. Nepal in Kihara, Fauna and Flora of Nepal Himalaya 104 (1955). He took *Listera Yatabei* Makino of Japan and *L. major* Nakai from N. Korea as synonymous under *L. pinetorum.* Kitamura's specimen was collected by Dr. Nakao, and is reported to have cilia on the margin of the lip. If the cilia actually exsist on the specimen, the specimen can not be *Listera pinetorum.* In our specimens I could not find any such cilia even under the microscope. Refer to plate 9. In the all above mentioned literature, there are discriptions and figures suggesting the existence of cilia on the margin of the lip.

Listera tenuis Lindley in Journ. Linn. Soc. **1**: 176 (1857)–Hook. f., Fl. Brit. Ind. **6**: 104 (1890); Icon. Pl. t. 2169 (1893)–King et Pantl., Orch. Sikkim. 255, t.

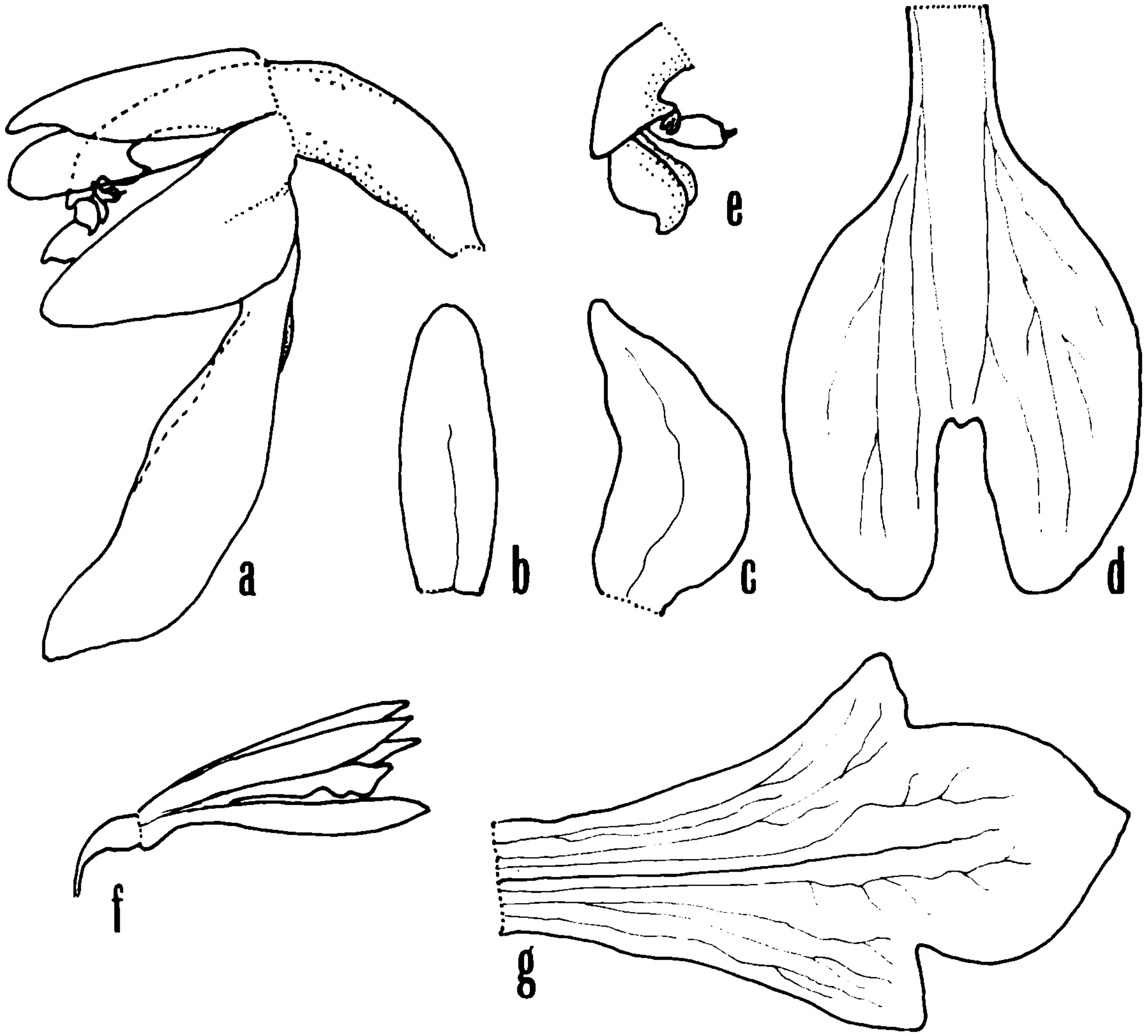

Fig. 22. Himalayan Orchid Flowers (6). a–e. *Listera pinetorum*. a. Flower, side view, b. Lateral sepal, c. Petal, d. Lip, spread out, a–d ×ca. 8, e. Column, apical portion, ×ca. 12. f–g. *Nervilia Aragoana* (S. of Dharan, Jun. 1, 1972). f. Flower, side view, ×ca. 2, g. Lip, spread out, × ca. 4.2.

337 (1898).

Nepal. Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972).

Distr. Subalpine Himalaya (Nepal, Sikkim) and Tibet (Chumbi Valley).

In our specimen, the size of the tepals is somewhat different from those given in the literature mentioned above, but the important characters match well with ours. Our specimen was collected scatteredly at the dark place in a *Rhododendron arboreum* var. *Campbelliae* forest. According to Dr. Kanai's field note, the lip is white and semitransparent with dark green midrib. The other perianth lobes are also semitansparently whitish with greenish midrib. The axis of the spike is pale green and puberulous in white.

Malaxis acuminata D. Don: Fl. E. Himal. 443 (1966); **2**: 191 (1971).

Nepal. Mane Gaon–Thale, 1240–2000 m (Jun. 24, 1970); Dingla–Nessum, 800–1300 m (Jul. 2, 1972); Nessum–Bhuje, 1300–2700 m (Jul. 3, 1972); Dor–Chitre, 2600–2300 m (Jul. 7, 1972); Dhara Pani–Dharan, 1300–400 m (Jul. 10, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

One of the commonly occuring species of the genus in the area we have botanized.

Malaxis muscifera (Lindley) O. Kuntze: Fl. E. Himal. 444 (1966); **2**: 191 (1971).

NEPAL. Phulchoki, 2200–2770 m (Aug. 6, 1969); Ingyur–Tsedang Pokhari, 2100–3000 m (Aug. 22, 1969); Kyangjing, 3800 m (Jun. 14, 1970); Oo Kharka–Mul Kharka, 3400–3800 m (Jul. 1, 1970); Dor–Chauke, 2600–2700 m (Jun. 7, 1972); Thudam–Lama Chungbu, 3700 m (Jul. 23, 1972); Lama Chungbu–Thudam, 3400 m (Jun. 24, 1972); Thudam, 3400 m (Jun. 25, 1972); Chauke–Dor, 2900–2600 m (Jul. 6, 1972); Tinjure, 2900 m (Jul. 6, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000-3000 m (Jul. 30, 1972); Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972); Phalut, 3200 m (Aug. 3, 1972).

Presumably most commonly distributing and abundant alpine species in the genus.

Nervilia Aragoana Gaudichaud, Freyc. Voy. Bot. 422, t. 35 (1829)–J. J. Sm. in Bull. Btzg. ser. 3, **3**: 236 (1921)–Holttum, Orch. Malay. ed. 3, 106 (1964).

Pogonia flabelliformis Lindley, Gen. Sp. Orch. 415 (1840)–Duthie in Ann. Bot. Gard. Calc. **9**: 158, t. 125 (1906)–J. J. Sm., Orch. Java. **6**: 57, t. 36 (1906 et 1912).

P. Gammieana Hooker f. in Bot. Mag. t. 6671 (1883); Fl. Brit. Ind. **6**: 120 (1890)–King et Pantl., Orch. Sikkim. 269, t. 359 (1898)–Duthie in Ann. Bot. Gad. Calc. **9**: 158 (1906).

NEPAL. S. of Dharan, in the Terai forest, 200 m (Jun. 1, 1972).

Distr. Tropical Himalaya (Garhwar to Sikkim), Peninsular India through Malaysia to Polynesia (Samoa).

Only one plant was collected by Mr. Ohba, to whose photograph I owe the posture and the colour of the plant. Scape is brown, becoming more reddish up to the spike. Flowers are subnutant, with the tepals half opened coloured with pale green, measuring to about 17 mm long. The ovary with the pedicel is dirty red. Total length of plant is 19 cm, excluding the globose tuber; about 2.0 cm in diameter. There are two amply amplexicaul sheaths near the base of the stem, and a linearly lanceolate bract at the midway of the flowering spike.

Oberonia falcata King et Pantling: Fl. E. Himal. 445 (1966); **2**: 191 (1971).

NEPAL. Chitlang-Thankot, 2250-1500 m (Sep. 4, 1970).

Orchis Chusua D. Don: Fl. E. Himal. **2**: 191 (1971).

NEPAL. Rock Shelter I to II, 3270–3220 m (Aug. 24, 1969); Gotiora–Gadje, 3280–3220 m (Aug. 25, 1969); Langtang–Kyangjing, 3500 m (Jul. 16, 1970); Lama Chungbu–Thudam, 4400-3400 m (Jun. 24, 1972, white or paler coloured flower); Kipuphu–Topke Gola, 4800–3600 m (Jun. 27, 1972); Thale–Mangen, 3400–3100 m (Aug. 27, 1972).

DARJEELING. Phalut, 3600 m (Aug. 3, 1972); Phalut–Singalila, 3600–3700 m (Aug. 3, 1972).

A common alpine species in the genus *Orchis*.

Orchis spathulata Reichenbach f. ex Bentham in Journ. Linn. Soc. **18**: 355 (1880)–Hooker f., Fl. Brit. Ind. **6**: 127 (1890); in Icon. Pl. t. 2197 B (1894)–King et Pantl, Orch. Sikkim. 301, t. 400 (1898).

NEPAL. Topke Gola, 3800 m (Jun. 19, 1972); Lama Chungbu–Thudam, 4400–3400 m (Jun. 24, 1972).

Distr. Alpine Himalaya (C. Nepal).

According to J. D. Hooker, this is distinguished from *O. Chusua* mainly by the leaves much broader, rounded at the apex, distinctly long-petiolated, and the lip being not trilobate but rounded at the apex.

Orchis Stracheyi Hooker f., Fl. Brit. Ind. **6**: 128 (1890); in Icon. Pl. t. 2197 A (1894).

NEPAL. Lama Chungbu, 4400 m (Jun. 23, 1972).

Distr. Alpine Himalaya (C. & E. Nepal).

J. D. Hooker (l.c. 128) suggests that this species may be a hybrid between *O. Chusua* and *O. spathulata*. My view is almost in the same line as Hooker's. In this respect, further confirmation is needed.

Oreorchis micrantha Lindley: Fl. E. Himal. 446 (1966); **2**: 192 (1971).

NEPAL. Dor–Chauke, 2600–2900 m (Jun. 7, 1972); Lamo Pokhari, 2900 m (Jun. 10, 1972); Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972).

The epichile is strongly wavy at the margins. According to Dr. Kanai's field note, the flower is white with many minute purple dots on the lip, and occasionally the same kind of dots but less in number on the petals. The column is coloured with yellow in the shape of a lancet on the anterior basal surface. The bulb is white inside, viscid but tasteless (fide Dr. Kanai).

Otochilus alba Lindley: Fl. E. Himal. **2**: 192 (1971).

NEPAL. Bhorlang–Sundarijar, 2400–1400 m (Aug. 31, 1972, fr.).

Otochilus fusca Lindley: Fl. E. Himal. 447 (1966); **2**: 192 (1971).

NEPAL. Bhuktani–Sukaura, 1350–450 m (Jan. 8, 1970).

Pholidota articulata Lindley [in Wall. Cat. no. 1992 (1829), nom. nud.] Gen. Sp. Orch. 38 (1830); in Bot. Reg. 44 (1839)—Hooker f., Fl. Brit. Ind. **5**: 844 (1890).

SIKKIM. Orchid Sanctuary or its vicinity, 1700 m (Jun. 27, 1969).

Distr. Subtropical Himalaya (Kumaon eastwards to Sikkim) and Khasia.

Pholidota Griffithii Hooker f., Icon. Pl. t. 1881 (1889); Fl. Brit. Ind. **5**: 845 (1890): Fl. E. Himal. **2**: 193 (1966).

NEPAL. Garhi Danra–Tuwa, 1600–1800 m (Nov. 4, 1963); Ghatte–Khebang, 2400–1700 m (Nov. 19, 1963).

SIKKIM. Gangtok, Orchid Sanctuary or its vicinity, 1700 m (Jun. 27, 1969).

Distr. Subtropical Himalaya (E. Nepal and Sikkim).

This species is separable from *P. articulata* Lindl. in the bract being larger, 13–14 mm long and with the apex sharply acute, while in the latter it is 5–8 mm long and with the apex truncately obtuse. The flower of the former species is also decidedly larger than that of the latter, that is, for example, the sepals are 8 mm long against 5 mm long.

Pholidota imbricata (Roxburgh) Lindley: Fl. E. Himal. 447 (1966); **2**: 193 (1971).

NEPAL. Dunche–Shyaprubensi, 2000–1500 m (Jun. 26, 1970); Okhre Danra–Kuli Khani, 1950–1450 m (Sep. 2, 1970).

DARJEELING. Darjeeling–Tista, 2200–400 m (Aug. 10, 1972).

Pleione Hookeriana (Lindley) O. Kuntze: Fl. E. Himal. 448 (1966); **2**: 193 (1971).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972); Dor–Chauke, 2600–2900 m (Jun. 7, 1972); Suke-Hile Chok, 2900–3600 m (Jun. 11, 1972); Thudam, 3400 m (Jun. 22, 1972); Lama Chungbu–Thudam, 4500–3400 m (Jun. 24, 1972); Topke Gola–Shewaden, 3600–2600 m (Jun. 28, 1972).

Pleione humilis (Smith) D. Don: Fl. E. Himal. 448 (1966).

NEPAL. Sim Bhanjyang, 2500 m (Mar. 1, 1970).

Pleione praecox (Smith) D. Don: Fl. E. Himal. 449 (1966); **2**: 194 (1971).

NEPAL. Thale–Thale Bisauna, 2500 m (Sep. 10, 1970); Chitre–Tute, 2400–2300 m (Jun. 6, 1972); Khodang Danda–Latsu, 2500–2100 m (Aug. 29, 1972); Bhorlang–Sundarijar, 1700 m (Aug. 31, 1972).

Satyrium nepalense D. Don: Fl. E. Himal. 450 (1966); **2**: 194 (1971).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 2, 1972); Mangen–Khodang Danda, 3100–2500 m (Aug. 28, 1972); Latsu–Bhorlang, 2400–1700 m (Aug. 30, 1972).

Spathoglottis ixioides (D. Don) Lindley, Gen. Sp. Orch. 120 (1831); in Journ. Linn. Soc. **3**: 22 (1859)–Bot. Mag. t. 7060 (1889)–Hooker f., Fl. Brit. Ind. **5**: 814 (1890)–King et Pantl., Orch. Sikkim. 100, t. 139 (1898).

Cymbidium ixioides D. Don, Prodr. Fl. Nepal. 36 (1825).

NEPAL. Dunche, 2000 m (Aug. 21, 1972).

This lovely orchid was collected in the crevices of rocky cliff in sunny places. The scape is 1- or rarely 2-flowered. The flowers are as a whole bright yellow, minutely spotted with red on the hypochile of the lip inside (photographs of all the members). The epichile is truncately obtuse, acutely unidentate on both sides: the lower margins, 3-carinate from the middle to the upper portion of the hypochile, where the middle one is obscure, and the laterals are dilated to form semiorbicular lamellae, these two lamellae being converged to unite with the middle one, forming a rather thick midrib running down to the very base of the hypochile. The outer surface of these lamellae and the thick midrib are densely hairy, but becoming gradually sparsely so, finally glabrate at the middle portion of hypochile. The hypochile extends to the large orbicular side-lobes, and is ventriocosely saccate at the base.

Spiranthes sinensis (Persoon) Ames

var. **amoena** (M.-Bieberstein) Hara: Fl. E. Himal. **2**: 194 (1971).

NEPAL. Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Bhorlang–Sundarijar, 2400–1400 m (Aug. 31, 1972).

DARJEELING. Phalut–Raman, 3600–2100 m (Aug. 4, 1972); Raman–Rimbick, 2400–1900 m (Aug. 5, 1972); Darjeeling–Lopchu, 2300–800 m (Aug. 12, 1972).

Thunia alba (Lindley) Reichenbach f.: Fl. E. Himal. 451 (1966).

NEPAL. Shyaprubensi–Dunche, 1500–2000 m (Jul. 19, 1970); Okhre Danra–Deorali, 1950–1900 m (Sep. 2, 1970).

ADDITION

PANDANACEAE

Our Himalayan collections of the genus *Pandanus* were identified by Prof. H. St. John. The following is based on his paper: St. John, H. 1972. The Indian species of *Pandanus* (Section Rykia). Bot. Mag. Tokyo **85**: 241–262.

Pandanus nepalensis St. John in Bot. Mag. Tokyo **85**: 254, figs. 7–8 (1972).

NEPAL. Siwanta, 1000 m (Kanai & Bista, Apr. 23, 1969, no. 21857, fr.).

Distr. Himalaya (Nepal).

Pandanus sikkimensis St. John in Bot. Mag. Tokyo **85**: 258, fig. 9 (1972).

DARJEELING. Tista, 400 m (Kanai, Murata & Togashi, Jun. 20, 1960, no. 3275); cult, in Tokyo (Togashi, Mar. 8, 1972).

Distr. Himalaya (Sikkim).

PTERIDOPHYTA (by Kunio Iwatsuki)

The materials cited in the present enumeration are mostly those collected during the Fifth Expedition, though some earlier collections are included in case it is necessary. Among the specimens collected during the preceding Expeditions, there are the specimens which have already been cited in the first and/or second volumes but are corrected the determination here; the other specimens are kept unnamed and have been excluded from the former lists. Several specimens in the latter case were identified by Professor M. Tagawa and are cited in the following enumeration with T in parenthesis just after the date of collections concerned.

The families are arranged in the system of Copeland: Genera Filicum (1947). This system is not current at present and the name of the largest family is incorrect according to the code of nomenclature, though this arrangement of families is followed here for convenience' sake to bring the comparison with the former lists easier.

EQUISETACEAE

Equisetum debile Roxb. ex Vaucher: Tagawa in Fl. E. Himal. **2**: 197 (1971).

NEPAL. Kathmandu Airport, 1300 m (Oct. 13, 1963-T); Dhara Pani–Dhankuta, 350–1200 m (Oct. 17, 1963–T); Iladanda–Helok, 1500–1800 m (Nov. 13, 1963–T); Tharpu-near Chyangthaphu, 900–1200 m (Nov. 26, 1963–T); South of Dharan, 200 m (Jun. 1, 1972); Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972).

Equisetum diffusum Don: Fl. E. Himal. **2**: 197 (1971).

NEPAL. Dhankuta–Murhay, 1500–2100 m (Oct. 23, 1963–T); Taplejung, ca 1700 m (Nov. 2, 1963–T); Tuwa–Taplethok (Nov. 5, 1963–T); Taplethok–Helok (Nov. 6, 1963–T); Khebang–Bharomdin (Nov. 24, 1963–T); Sinduwa–Bhalukhop, 2000–2400 m (Jun. 5, 1972); Mewa Khola, 2100 m (Jun. 29, 1972); Bhuje–Chauke, 2700–2900 m (Jul. 4, 1972); Chitre–Hile, 1900–2400 m (Jul. 8, 1972).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

LYCOPODIACEAE

Lycopodium cernuum L.: Tagawa in Fl. E. Himal. **2**: 197 (1971).

NEPAL. Tuwa–Taplethok, 1300–1700 m (Nov. 5, 1963).

Lycopodium clavatum L.: Fl. E. Himal. **2**: 198 (1971).

NEPAL. Mure–Sinduwa, 2100 m (Jun. 5, 1972); Topke Gola–Shewaden, ca 3200 m (Jun. 28, 1972).

DARJEELING. Tonglu–Sandakphu, ca 3200 m (Jul. 31, 1972).

Lycopodium Hamiltonii Spr., Syst. Veg. **5**: 429 (1828)–Clarke in Trans. Linn. Soc. II. Bot. **1**: 590 (1880).

NEPAL. Tuwa–Taplethok, 1200–1700 m (Nov. 5, 1963); Khebang, 1400 m (Nov. 23, 1963); near Chyangthaphu–Birwa, 1100–2000 m (Nov. 27, 1963); Birwa–Yektin, 1400–

2400 m (Nov. 28, 1963); Batasay–Bhuspate Danra, 2200–2600 m (Dec. 1, 1963); Bhuspate Danra–Mai Majuwa, 1600–3100 m (Dec. 3, 1963); Sim Chotala–Thale, 900–2200 m (Jun. 2, 1969); Godawari–Phulchoki, 1600–2500 m (Jun. 23 & 26, 1967); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

BHUTAN. Tongsa–Tashiling, 1900–2300 m (Apr. 19, 1967); Samtengang–Choojom, 1500–2100 m (Apr. 26, 1967); Tinlegang, 1950 m (May 4, 1967).

Distr. Himalaya, Indo-China, S. China, Formosa, and S. Japan.

Lycopodium Herterianum Kümm.: Fl. E. Himal. **2**: 198 (1971).

NEPAL. Tinjure–Tinjure Phedi, 2700–2900 m (Jun. 7, 1972); Mul Pokhari–Lamo Pokhari, 2900 m (Jun. 8, 1972); Lamo Pokhari, 2900 m (Jun. 9, 1972); Lamo Pokhari–Gupha Pokhari, 2800–2900 m (Jun. 10, 1972); Topke Gola, 3600 m (Jun. 19, 1972); Lamo Pokhari–Chauke, 2700–2900 m (Jul. 4, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972).

Lycopodium pulcherrimum Wall. ex Hook. et Grev., Ic. Fil. **1**: 38 (1827)– Alston & Bonner in Candollea **15**: 193 (1956).

Lycopodium setaceum Ham. ex Don var. *pulcherrimum* (Wall. ex Hook. et Grev.) Clarke in Trans. Linn. Soc. II. Bot. **1**: 590 (1880).

NEPAL. Sim Chotala–Thale, 900–2200 m (Jun. 2, 1969); Thale–Dunche, 2100–2200 m (Jun. 3, 1969); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

Distr. Nepal and Formosa.

The two specimens of 1969 collections are preidentified as *L. subulifolium* but different from the nominal species in less adnate broader leaves of thicker texture and midribs rather distinct beneath.

Lycopodium Selago L., Sp. Pl. ed. 1, **2**: 1102 (1753).

NEPAL. Minchin Dhap–Mul Pokhari, ca 2800 m (Oct. 29, 1963–T); Lamo Pokhari, 2900 m (Jun. 9, 1972); Lamo Pokhari–Gupha Pokhari, 2800-2900 m (Jun. 10, 1972); Thudam–Kipuphu, 3400–4500 m (Jun. 26, 1972).

Distr. Warm temperate regions in N. Hemisphere.

Lycopodium Veitchii Christ: Fl. E. Himal. **2**: 200 (1971).

NEPAL. Suke–Hile Chok, 2900–3500 m (Jun. 11, 1972).

SELAGINELLACEAE

Selaginella bisulcata Spring: Tagawa in Fl. E. Himal. **2**: 200 (1971).

NEPAL. Mai Majuwa–Dhara Pani, 1500–1800 m (Dec. 4, 1963); Tinjure Phedi–Chauke, 2700 m (Jun. 7, 1972).

DARJEELING. Ubayuri-dani, 2250 m (Jun. 23, 1969–T).

Selaginella ciliaris (Retz.) Spring in Bull. Acad. Brux. **10**: 231 (1843)– Alston in Proc. Nat. Acad. Sci. India **11**: 227 (1945).

Lycopodium ciliare Retz., Obs. **5**: 32 (1789).

NEPAL. Phusri–Dhara Pani, 450–1200 m (Oct. 16, 1963); Dumhan, ca 700 m (Oct. 31, 1963); Bharomdin–Tharpu, 700–1200 m (Nov. 25, 1963); Sibganja–Mahara Bakara, ca 200 m (Dec. 12, 1963); Kathagara–Rangali, ca 200 m (Dec. 14, 1963); Dingla–Doban, 800–1000 m (Jul. 2, 1972); Teku Nala–Tamur Bridge, 300–800 m (Jul. 9, 1972).

DARJEELING. Darjeeling–Tista, ca 600 m (Aug. 10, 1972).

Distr. India, Himalaya, S. China, and through Malaysia to Australia.

Selaginella chrysocaulos (Hook. et Grev.) Spring: Fl. E. Himal. **2**: 200

(1971).

NEPAL. Dankuta–Sinduwa, 1200–2100 m (Oct. 22, 1963); Sinduwa, 2100 m (Oct. 24, 1963); Ghatte–Khebang, 1600–2400 m (Nov. 19, 1963); Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Shewaden–Papung, ca 2400 m (Jun. 29, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972); Phulchoki, ca 1500 m (Jul. 15, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, ca 2100 m (Aug. 4, 1972); Palmajua–Batasi, 2100–2200 m (Aug. 8, 1972); Darjeeling–Tista, ca 600 m (Aug. 10, 1972).

Selaginella chrysorhizos Spring in Mém. Acad. Sci. Brux. **24**: 244 (1850)–Alston, l.c. 226 (1945).

NEPAL. Ghatte–Khebang, 1600–1700 m (Nov. 19, 1963).

Distr. E. Nepal, Assam, Burma, and N. Thailand.

Selaginella involvens (Sw.) Spring: Fl. E. Himal. **2**: 200 (1971).

NEPAL. Murhay–Bilbatay Bhanjyang, 2000–2200 m (Oct. 24, 1963); Mul Pokhari–Dumhan, 1500–2000 m (Oct. 30, 1963); Tuwa–Taplethok, 1300–1700 m (Nov. 5, 1963); Zongri–Iladanda, 1800–2600 m (Nov. 12, 1963); Iladanda–Helok, 1500–1800 m (Nov. 13, 1963); Mai Majuwa–Dhara Pani, 1500–1900 m (Dec. 4, 1963); Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Shewaden–Mewa Khola, 2100–2600 m (Jun. 29, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972).

DARJEELING. Ubayuri-dani, 2000 m (Jul. 25, 1972); Phalut–Raman, ca 2200 m (Aug. 4, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

SIKKIM. Damthang–Gangtok, 1600–2900 m (Jun. 29, 1969–T).

Distr. Ceylon, India generally, Himalaya, through China to S. Korea and Japan, south to Celebes, and Flores.

Selaginella Kurzii Baker in Journ. Bot. **23**: 249 (1885)–Alston, l.c. 226 (1945).

NEPAL. Mul Pokhari–Dumhan, 700–2500 m (Oct. 30, 1963); Dumhan, by the Tamur River, ca 700 m (Oct. 31, 1963).

Distr. E. Nepal, Assam, Burma, Thailand, and Malaya.

Selaginella monospora Spring: Fl. E. Himal. **2**: 200 (1971).

NEPAL. Selap–Walunchung Gola, 2600–3500 m (Nov. 10, 1963); Khebang–below Siling Tzokupa, 1700–2100 m (Nov. 20 & 22, 1963); Mai Majuwa–Dhara Pani, 1500–1600 m (Dec. 4, 1963); Shewaden–Papung, ca 2400 m (Jun. 29, 1972); Dingla–Doban, 800–1000 m (Jul. 2, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); East Side, 2100 m (Jul. 23, 1972); Palmajua, 2200 m (Aug. 7, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972); Darjeeling–Tista, ca 800 m (Jul. 10, 1972).

SIKKIM. Gangtok, 1700–1800 m (Jun. 27, 1967).

BHUTAN. Khosa–Tamji, 1800–2200 m (May 11, 1967); Tamji–Gasa, 2200–2800 m (May 13, 1967).

Distr. Himalaya, Burma to Indo-China, S.W. China, and Hainan.

Selaginella pallidissima Spring in Bull. Acad. Brux. **10**: 231 (1843)–Alston, l.c. 276 (1945).

DARJEELING. Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

Distr. W. Himalaya and Darjeeling.

Selaginella pennata (Don) Spring in Mém. Acad. Sci. Brux. **24**: 257 (1850)–Alston, l.c. 225 (1945)–Alston & Bonner in Candollea **15**: 195 (1956).

Lycopodium pennatum Don, Prodr. Fl. Nepal. 18 (1825).

Nepal. Shewaden–Mewa Khola, 2300–2400 m (Jun. 29, 1972).

Darjeeling. East Side, 2100 m (Jul. 23, 1972); Phalut–Raman, ca 2200 m (Aug. 4, 1972); Darjeeling–Tista, ca 1000 m (Aug. 10, 1972).

Distr. N.E. India, Himalaya, Burma, and N. Thailand.

Selaginella repanda (Desv.) Spring in Gaud., Voy. Bonite Bot. **1**: 329 (1846)–Alston, l.c. 217 (1945)–Alston & Bonner, l.c. 194 (1956).

Lycopodium repandum Desv. ex Poir., Encycl. Suppl. III, 558 (1814).

Nepal. Khebang–Bharomdin, 1000–1700 m (Nov. 24, 1963); Bharomdin–Tharpu, 1000–1200 m (Nov. 25, 1963); Yektin–Batasay, 1400–2400 m (Nov. 30, 1963); Pokhara, 900 m (Jun. 18, 1967); Godawari–Phulchoki, 1600–2500 m (Jun. 26, 1967); Phulchoki, ca 2200 m (Jul. 15, 1972); Kathmandu, ca 1300 m (May 28, 1972); Dharan–Sanguri Bhanjyang, ca 1000 m (Jun. 2, 1972).

Bhutan. Wangdu Phodrang–Samtengang, 1450–2100 m (Apr. 10, 1967); Ritang–Rukubi, 2600–3400 m (Apr. 13, 1967).

Distr. Himalaya, Thailand, Indo-China, S. China, Formosa, and W. Malaysia to Timor.

Selaginella tenuifolia Spring in Mém. Acad. Sci. Brux. **24**: 253 (1850)–Alston, l.c. 226 (1945).

Nepal. Bhandukay–Ghatte, 1600–2500 m (Nov. 16, 1963); Khebang–below Siling Tzokupa, 1700–2100 m (Nov. 20, 1963).

Distr. E. Himalaya, Burma, and N. Thailand.

Selaginella vaginata Spring: Fl. E. Himal. **2**: 201 (1971).

Nepal. Ghatte–Khebang, 1600–2400 m (Nov. 19, 1963); Mai Majuwa–Dhara Pani, 1500–1800 m (Dec. 4, 1963); Shewaden–Papung, 2000–2600 m (Jun. 29, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

Darjeeling. Palmajua–Batasi, 2100–2200 m (Aug. 8, 1972).

Distr. E. Himalaya, Burma, and N. Thailand.

OPHIOGLOSSACEAE

Botrychium lanuginosum Wall. ex Hook. et Grev., Ic. Fil. **1**: 79 (1829).

Japonobotrychium lanuginosum (Wall.) Nishida ex Tagawa: Nishida in Fl. E. Himal. 453 (1966); H. Ito in **2**: 201 (1971).

Nepal. Hile–Chitre, 1900–2400 m (Jun. 5, 1972); Shewaden–Papung, ca 2200 m (Jun. 29, 1972); Phulchoki, ca 2300 m (Jul. 15, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

Darjeeling. East Birch Hill Road, 2100 m (Jul. 22, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Distr. Ceylon, S. India, E. Himalaya, and S. China to Malaysia.

Botrychium Lunaria (L.) Sw. in Shrad. Journ. Bot. **1800** (2): 110 (1801)–Clausen in Mem. Torrey Bot. Cl. **19**: 62 (1938).

Nepal. Topke Gola, 3600 m (Jun. 18, 1972); Topke Gola–Shewaden, ca 3500 m (Jun. 28, 1972).

Distr. Temperate regions in N. Hemisphere and Australia, Tasmania, New Zealand, and Patagonia.

Botrychium multifidum (Gmel.) Rupr. in Beitr. Pfl. Russ. Reiches **11**: 40

(1859).

Sceptridium multifidum (Gmel.) Nishida ex Tagawa: Fl. E. Himal. 454 (1966); **2**: 201 (1971).

NEPAL. Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

Ophioglossum petiolatum Hook.: Fl. E. Himal. 453 (1966); **2**: 201 (1971).

NEPAL. Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

OSMUNDACEAE

Osmunda Claytoniana L.: H. Ito in Fl. E. Himal. 455 (1966), cum var. *vestita* Milde; **2**: 201 (1971), ut var. *vestita* Milde.

NEPAL. Tinjure–Tinjure Phedi, 2700–2900 m (Jun. 7, 1972); Chauke–Lamo Pokhari, 2600–2900 m (Jun. 8, 1972); Kokim Pokhari–Hati Surde, 3000–3600 m (Jun. 11, 1972).

DARJEELING. Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. Himalaya, China, Formosa, Japan, Korea, Siberia, and N. America.

Var. *vestita* was distinguished from var. *Claytoniana* by having deep ferrugineous tomentum on stipe and rachis instead of whitish brown ones in the latter variety, although these 'varieties' indicated by such a feature can not be separated by the continuous variation of coloration of the tomentum.

SCHIZAEACEAE

Lygodium flexuosum (L.) Sw.: H. Ito in Fl. E. Himal. 455 (1966); **2**: 202 (1971)–Banerji in Candollea **27**: 268 (1972).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972); Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

DARJEELING. Darjeeling–Tista, ca 600 m (Aug. 10, 1972).

Distr. Old World tropics in general, Ceylon to Queensland, north to Himalaya.

Lygodium japonicum (Thunb.) Sw.: Fl. E. Himal. 455 (1966)–Banerji, l.c. 268 (1972).

NEPAL. Sanguri Bhanjyang–Dhara Pani, ca 1250 m (Jun. 2, 1972).

Distr. Ceylon, Himalaya, N. Thailand, Indo-China, China north to Chekiang, Korea, Japan, and throughout Malaysia to New Guinea.

GLEICHENIACEAE

Gleichenia gigantea Wall. ex Hook. et Bauer, Gen. Fil. t. 39 (1840.)

Diplopterygium volubile (Jungh.) Nakai sensu H. Ito in Fl. E. Himal. 456 (1966); **2**: 202 (1971).

NEPAL. Mure–Sinduwa, 2100 m (Jun. 5, 1972); Mewa Khola–Papung, ca 2200 m (Jun. 29, 1972); Phulchoki, ca 1800 m (Jul. 15, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Phalut–Raman, ca 2300 m (Nov. 4, 1972).

Distr. Himalaya, Upper Burma, and Yunnan.

Dicranopteris linearis (Burm.) Underw.: Fl. E. Himal. 456 (1966); **2**: 202 (1971)–Banerji in Candollea **27**: 273 (1972).

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972).

Distr. Tropics and subtropics of the Old World.

HYMENOPHYLLACEAE

Crepidomanes insigne (v. d. Bosch) Fu, Ill. Handb. Chin. Pl. Pterid. 39 (1957).

Didymoglossum insigne v. d. Bosch in Ned. Kruid. Arch. **5** (3): 143 (1863)–Copel. in Philip. Journ. Sci. **51**: 194 (1933).

Crepidomanes sp. aff. *C. Makinoi* (C. Chr.) H. Ito: K. Iwatsuki in Fl. E. Himal. 456 (1966); **2**: 202 (1971).

NEPAL. Ghatte–Khebang, 1700–2400 m (Nov.16, 1963); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Himalaya to S. China.

It is rather difficult at present to identify the Himalayan *Crepidomanes* to one of the several species described by van den Bosch. The present materials are identified to belong to a single species at least from the morphological point of view and named here as *C. insigne*.

Crepidomanes late-alatum (v. d. Bosch) Copel.: Fl. E. Himal. 456 (1966); **2**: 202 (1971).

NEPAL. Mure–Sinduwa, 2100 m (Jun. 5, 1972); Shewaden–Papung, ca 2400 m (Jun. 29, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972).

Hymenophyllum Simonsianum Hook.: Fl. E. Himal. 456 (1966); **2**: 203 (1971).

Nepal. Lamo Pokhari, 2900 m (Jun. 9, 1972); Shewaden–Mewa Khola, 2400 m (Jun. 29, 1972).

Mecodium badium (Hook. et Grev.) Copel.: Fl. E. Himal. 457 (1966).

NEPAL. Shewaden–Mewa Khola, 2400 m (Jun. 29, 1972).

DARJEELING. Raman–Rimbick, 1900–2200 m (Aug. 5, 1972).

Distr. Himalaya to Formosa and throughout Malaysia, southwest to Ceylon, and north to Japan.

Mecodium exsertum (Wall. ex Hook.) Copel.: Fl. E. Himal. 457 (1966); **2**: 203 (1971)–Banerji in Candollea **27**: 271 (1972).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Lamo Pokhari, 2900 m (Jun. 9, 1972); Shewaden–Papung, 2500 m (Jun. 29, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

DARJEELING. Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972).

Distr. Himalaya, Upper Burma, Thailand, Indo-China, south to Malaya, and China.

Mecodium polyanthos (Sw.) Copel.: Fl. E. Himal. 457 (1966); **2**: 203 (1971)–Banerji in Candollea **27**: 271 (1972).

NEPAL. Hile-Chitre, 1900-2400 m (Jun. 5, 1972); Chitre-Basantapur, 2300-2400 m (Jun. 6, 1972); Dor-Tinjure, 2600-2900 m (Jun. 7, 1972); Hile Chok-Gopte, 3500 m (Jun. 12, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Topke Gola–Jalang Chhyongo, 3800 m (Jun. 20, 1972); Thudam, 3400 m (Jun. 22 & 24, 1972); Topke Gola–Shewaden, 3000 m (Jun. 28, 1972); Bhorlang-Sundarijar, 1400-2400 m (Aug. 31, 1972).

DARJEELING. Mani Bhanjyang-Tonglu, 2000-3000 m (Jul. 30, 1972); Sandakphu, 3600 m (Aug. 1, 1972).

Vandenboschia auriculata (Blume) Copel.: Fl. E. Himal. 458 (1966); **2**: 203 (1971).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Vandenboschia radicans (Sw.) Copel.: Fl. E. Himal. 458 (1966); **2**: 203 (1971).

DARJEELING. Phalut–Raman, 2100 m (Aug. 4, 1972).

Vandenboschia titibuensis H. Ito in Journ. Jap. Bot. **24**: 125, f. 1 (1949).

NEPAL. Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Lamo Pokhari, 2900 m (Jun. 9, 1972); Shewaden–Mewa Khola, 2500 m (Jun. 29, 1972).

Distr. E. Nepal (new record) and Japan.

This species was found in E. Nepal on moist perpendicular surface of rocks in shade, in the habitat similar to that in Japan.

PTERIDACEAE

Actiniopteris semiflabellata Pichi-Ser.: H. Ito in Fl. E. Himal. 458 (1966).

A. dichotoma Forsk. sensu Banerji in Candollea **27**: 270 (1972).

NEPAL. Mohamabedi Khola–Tamur Bridge, 300–400 m (Jun. 3, 1972); Teku Nala–Tamur Bridge, ca 700 m (Jul. 9, 1972).

Distr. Africa, Yemen, Arabia, and E. Nepal.

The occurrence of this species in E. Nepal is rather peculiar considering the geographical range of this species as a whole. In the localities cited above, we observed a plenty of individuals growing in crevices or on perpendicular surface of rocks on mountain slope and along the Tamur River, and even among the stone wall at the school house of Teku Nala.

Adiantum capillus-veneris L.: Fl. E. Himal. 458 (1966); **2**: 203 (1971)–Banerji in Candollea **27**: 268 (1972).

NEPAL. Mohamabedi Khola–Tamur Bridge, 300–400 m (Jun. 3, 1972).

Adiantum caudatum L.: Fl. E. Himal. 458 (1966); **2**: 203 (1971).

NEPAL. Kathmandu, ca 1300 m (May 28, 1972); south of Dharan, 200 m (Jun. 1, 1972); Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972).

DARJEELING. Lopchu–Tista, ca 600 m (Aug. 10, 1972).

Adiantum pedatum L.: Fl. E. Himal. **2**: 204 (1971).

NEPAL. Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972).

Adiantum philippense L.: Fl. E. Himal. 459 (1966); **2**: 204 (1971)–Banerji, l.c. 269 (1972).

NEPAL. Kathmandu, ca 1300 m (May 28, 1972); Kuwa Pani–Hile, 1900 m (Jun. 4, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

DARJEELING. Lopchu–Tista, ca 600 m (Aug. 10, 1972).

Adiantum venustum Don: Fl. E. Himal. 459 (1966).

NEPAL. Kathmandu, ca 1300 m (May 28, 1972).

Anogramma microphylla (Hook.) Diels: Fl. E. Himal. 459 (1966).

NEPAL. Lamo Pokhari, 2900 m (Jun. 8, 1972).

Cheilanthes albomarginata Clarke: Fl. E. Himal. 459 (1966).

NEPAL. Phulchoki, 2200–2700 m (May 28 & Jul. 15, 1972); Dharan, 450 m (Jun. 2, 1972); Mure–Sinduwa, 2100 m (Jun. 5, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

DARJEELING. East Side, 2100 m (Jul. 23, 1972).

Cheilanthes subrufa of Yunnan, N. Thailand and Tonkin is close to this species, especially in the scaly character which seems to be most important to discriminate the species of this group.

Cheilanthes anceps Blanford in Simla Nat. Hist. Soc. 25 (1886)–Bedd., Handb. Suppl. 21 (1892)–Hope in Journ. Bomb. Nat. Hist. Soc. **13**: 249 (1900)–Alston & Bonner in Candollea **15**: 203 (1956).

C. farinosa (Forsk.) Kaulf. sensu H. Ito in Fl. E. Himal. 460 (1966), p.p.

NEPAL. Helok–Iladanda, 1500–1800 m (Nov. 8, 1963); Iladanda–Selap, 1800–2600 m (Nov. 9, 1963); Yamphodin–Ghatte, 2100–1600 m (Nov. 18, 1963); Phulchoki, 2100–2800 m (May 29, 1969); Shewaden–Mewa Khola, ca 2400 m (Jun. 29, 1972).

Distr. E. Himalaya.

The species of *Cheilanthes farinosa* group are not yet thoroughly understood and it is rather difficult to separate some materials specifically from *Ch. farinsa*, though *Ch. anceps* is easily distinguished from the former by sparsely scaly under surface of rachis and costae.

Cheilanthes chrysophylla Hook.: Fl. E. Himal. 460 (1966).

NEPAL. Dor–Chauke, 2600–2900 m (Jun. 7, 1972).

Cheilanthes Duthiei Baker in Ann. Bot. **5**: 210 (1891)–Bedd., Handb. Suppl. 20 (1892).

NEPAL. Thudam, 3400 m (Jun. 22, 1972).

Distr. Himalaya.

Cheilanthes farinosa (Forsk.) Kaulf.: Fl. E. Himal. 460 (1966); **2**: 204 (1971)–Banerji in Candollea **27**: 270 (1972).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972); Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Distr. Tropics to warm temperate regions throughout the world; probably a composite species.

Cheilanthes subvillosa Hook., Sp. Fil. **2**: 87, t. 98 B (1852)–Bedd., Handb. 93 (1883)–Alston & Bonner, l.c. 204 (1956).

DARJEELING. Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972).

Distr. Himalaya.

Cheilanthes tenuifolia (Burm.) Sw.: Fl. E. Himal. 460 (1966).

NEPAL. Tamur Bridge–Mohamabedi Khola, 300–400 m (Jul. 9, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Coniogramme caudata (Presl. ex Ettingsh.) Ching: Fl. E. Himal. 460 (1966); **2**: 204 (1971).

NEPAL. Chitre–Basantapur, 2300–2400 m (Jun. 16, 1972); Shewaden–Papung, ca 2400 m (Jun. 29, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, ca 2300 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Coniogramme fraxinea (Don) Diels: Fl. E. Himal. 461 (1966)–Banerji, l.c. 270 (1972).

NEPAL. Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

DARJEELING. Lopchu, 800 m (Aug. 10, 1972).

Distr. S. India, Himalaya to Yunnan, N. Thailand, Tonkin, Formosa, Philippines, and Java.

Coniogramme intermedia Hieron.: Fl. E. Himal. 461 (1966); **2**: 204 (1971), cum var.

NEPAL. Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

Distr. Himalaya, Indo-China, China, Formosa, Japan, and Korea.

This species is distinguished into two varieties by the hairiness on the under surface of fronds. The above two collections belong to var. *villosa* by the definition, though these two varieties can not be recognizable occupied by the continuous variations of the hairiness. Moreover, I do not know at present to which variety the type of this species belongs.

Coniogramme procera Fée: Fl. E. Himal. 461 (1966).

DARJEELING. Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972); Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. Himalaya, N. Thailand, Yunnan, and Formosa.

Cryptogramma Brunoniana Wall. ex Hook. et Grev.: Fl. E. Himal. 461 (1966)–Banerji in Candollea **27**: 269 (1972).

NEPAL. Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972); Samdan–Slesa, 4400–4500 m (Jun. 24, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Gosainkund–Gopte, 3500–4400 m (Aug. 25, 1972).

Cryptogramma Stelleri (Gmel.) Prantl: Fl. E. Himal. **2**: 204 (1971).

NEPAL. Topke Gola–Jalang Chhyongo, ca 4000 m (Jun. 20, 1972).

Dennstaedtia appendiculata (Wall. ex Hook.) J. Smith: Fl. E. Himal. 462 (1966); **2**: 204 (1971).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972); Hile–Mure, 1900–2100 m (Jun. 5, 1972); Shewaden–Mewa Khola, ca 2300 m (Jun. 29, 1972); Tute–Basantapur, 2300 m (Jul. 7, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972).

Dennstaedtia scabra (Wall. ex Hook.) Moore: Fl. E. Himal. 462 (1966).

NEPAL. Tute, 2300 m (Jun. 6, 1972); Shewadan–Papung, ca 2400 m (Jun. 29, 1972); Lamo Pokhari–Chauke, 2700–2900 m (Jul. 4, 1972).

DARJEELING. Phalut–Raman, ca 2300 m (Aug. 4, 1972); Palmajua–Batasi, 2100–2200 m (Aug. 8, 1972).

Distr. Ceylon, Himalaya, Burma, Indo-China, Thailand, W. Malaysia, S. & C. China, Formosa, S. Korea, and Japan.

Hypolepis punctata (Thunb.) Mett. ex Kuhn: Fl. E. Himal. 462 (1966); **2**: 205 (1971)–Banerji, l.c. 271 (1972).

NEPAL. Sanguri Bhanjyang–Dhara Pani, ca 1250 m (Jun. 2, 1972); Shewaden–Papung, ca 2200 m (Jun. 29, 1972); Tute–Basantapur, 2300 m (Jul. 7, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Phalut–Raman, ca 3000 m (Aug. 4, 1972).

Lindsaea odorata Roxb. in Calc. Journ. Nat. Hist. **4**: 511 (1844)–Kramer in Blumea **15**: 567 (1968).

L. cultrata (Willd.) Sw.: Fl. E. Himal. 463 (1966); **2**: 205 (1971)–Banerji in Candollea **27**: 271 (1972).

NEPAL. Shewaden–Papung, ca 2200 m (Jun. 29, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Distr. Ceylon, India, Himalaya, Tibet, Burma, Thailand, Indo-China, Formosa to Japan, south to W. Melanesia and Australia through Malaysia, and west to Rhodesia and Madagascar.

Var. *darjeelingensis* was recently described by Sen & Sen, in Amer. Fern Journ. **71**: 14 (1971) based on their own collections from Darjeeling: on way to Birch Hill. I have collected a topotypic specimen similar to this variety which is known to me only by the description and figures. There is a variant which is smaller in size and bears the rhizome scales broader than the typical form and such a variant is also found in Taiwan. There are, however, various intermediate forms between typical *L. odorata* and this variant which seems to be a form named var. *darjeelingensis*, and I would prefer at present not to separate taxonomically such a variant which is extreme in appearance but is continuous to the typical form with various intermediate forms.

Microlepia firma Mett. ex Kuhn in Linnaea **36**: 146 (1869)–Sledge in Kew Bull. **1956**: 529 (1956).

M. trapeziformis (Roxb.) Kuhn sensu H. Ito in Fl. E. Himal. 463 (1966); **2**: 205 (1971).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Palmajua, 2000 m (Aug. 7, 1972).

Distr. Ceylon, E. Himalaya, Upper Burma, N. Thailand, and S. W. China (Yunnan).

Microlepia speluncae (L.) Moore: Fl. E. Himal. 463 (1966); **2**: 206 (1971).

NEPAL. Illam–Ranga Pani, 400–1200 m (Dec. 8, 1963); Dingla–Doban, 800–1000 m (Jul. 2, 1972).

DARJEELING. Tista, 400 m (Aug. 10, 1972).

Distr. Pantropic, usually in lower elevation.

Microlepia strigosa (Thunb.) Presl: Fl. E. Himal. **2**: 205 (1971)–Banerji, l.c., 271 (1972).

M. todayensis Christ sensu H. Ito in Fl. E. Himal. 463 (1966), p.p.

NEPAL. Pouwa, Kathmandu, 1600 m (Oct. 9, 1963).

DARJEELING. Lopchu, ca 1000 m (Aug. 10, 1972).

Microlepia trapeziformis (Roxb.) Kuhn: Fl. E. Himal. 463 (1966), nom. sol.

M. todayensis Christ sensu H. Ito in Fl. E. Himal. 463 (1966), p.p.

Nepal. Kathmandu Airport, 1400 m (Oct. 13, 1963); Helok–Iladanda, 1500–1800 m (Nov. 8, 1963).

Distr. Ceylon, E. Himalaya to S. W. China, Thailand, Malaya, Indo-China, southwards to Sumatra, and Java.

Monachosorum Henryi Christ: Fl. E. Himal. 463 (1966); **2**: 205 (1971).

Nepal. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

Darjeeling. Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. Himalaya, Indo-China, S. China, and Formosa.

Sino-Himalayan plants seem to be distinct from the Malaysian ones, and the Himalayan plants are here referred to *M. Henryi*. We usually observe conspicuous bulbils on the rachis of *M. Henryi*, though the bulbils are hardly found in *M. subdigitatum*.

Notholaena Marantae (L.) R. Br.: Fl. E. Himal. 464 (1966); **2**: 205 (1971).

Nepal. Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

Onychium contiguum Hope: Fl. E. Himal. 464 (1966).

Nepal. Chitre–Dor, 2300–2600 m (Jun. 6, 1972); Shewaden–Papung, ca 2200 m (Jun. 29, 1972); Tinjure–Dor, 2600–2900 m (Jul. 6, 1972).

Darjeeling. Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, ca 2400 m (Aug. 4, 1972.)

Distr. Himalaya, Tibet, Thailand, W. China, and Formosa.

Onychium japonicum (Thunb.) Kunze: Fl. E. Himal. 464 (1966); **2**: 206 (1971).

Nepal. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

Darjeeling. Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Onychium siliculosum (Desv.) C. Chr.: Fl. E. Himal. 464 (1966); **2**: 206 (1971)–Banerji, l.c. 269 (1972).

Nepal. Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972); Dingla–Doban, 800–1000 m (Jul. 2, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Darjeeling. Tista, 400 m (Aug. 10, 1972).

Pityrogramma calomelanos (L.) Link: Fl. E. Himal. 464 (1966); **2**: 206 (1971).

Nepal. Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Darjeeling. Tista, ca 400 m (Aug. 10, 1972).

Distr. Tropical America; naturalized in warm districts in Asia.

Pteridium aquilinum (L.) Kuhn var. **Wightianum** Tryon: Fl. E. Himal. 465 (1966); **2**: 206 (1971).

Nepal. Hile–Mure, 1900–2100 m (Jun. 5, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

Distr. Himalaya to Malaysia, and Formosa.

Pteris aspericaulis Wall. ex Ag., Rec. Sp. Gen. Pterid. 22 (1839)–Hieron. in Hedw. **55**: 348 (1914)–Alston & Bonner in Candollea **15**: 201 (1956).

P. quadriaurita var. *aspericaulis* (Wall. ex Ag.) Bedd., Handb. 111 (1883).

Nepal. Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Hile–Mure, 1900–2100 m (Jun. 5, 1972); Chitre–Dor, 2300–2600 m (Jun. 6, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972).

Distr. E. Himalaya, N. Burma, N. Thailand, and Yunnan.

Pteris biaurita L.: Fl. E. Himal. 465 (1966); **2**: 206 (1971)–Banerji in Candollea **27**: 270 (1972).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972); Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Pteris cretica L.: Fl. E. Himal. 465 (1966); **2**: 206 (1971).

NEPAL. Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

DARJEELING. Phalut–Raman, ca 2200 m (Aug. 4, 1972).

Pteris excelsa Gaud.: Fl. E. Himal. 466 (1966); **2**: 206 (1971).

NEPAL. Shewaden–Mewa Khola, ca 2500 m (Jun. 29, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

Distr. Himalaya to Polynesia through Malaysia, and north to S. China.

Pteris nepalensis H. Ito: Fl. E. Himal. 466 (1966).

NEPAL. Thudam, 3400 m (Jun. 25, 1972); Topke Gola–Shewaden, ca 3200 m (Jun. 28, 1972); Shewaden–Mewa Khola, ca 2300 m (Jun. 29, 1972); Lamo Pokhari–Chauke, 2700–2900 m (Jul. 4, 1972); Chauke–Tinjure Phedi, 2700 m (Jul. 6, 1972); Mangen–Khodang Danda, 2500–3200 m (Aug. 28, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972); Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. E. Himalaya and N. Thailand.

This is a species common in this area, 2000–3500 m alt. in E. Himalaya: the *Pteris* plants are not fed by the grazing animals and are abundant in open pasture. *Pteris quadriaurita* var. *Wightii* Hieron. in Hedwigia **55**: 334 (1914) seems to be the same as this, though I have not seen any authentic specimens of this variety. *Pteris tricolor* Hieron. l.c. 352 may be a form of this species with white band along costae and purplish stipe, and it may be safe to refer this form to a variant of our species: in such case, the correct name for our plants should be *P. tricolor*. Further investigation should be made for the Himalayan species belonging to the group of *P. quadriaurita*, and I can not give here a correct name of our species until I will examine the type materials of the taxa described by Hieronymus. We can refer a specimen to this species from the higher mountain of N. Thailand where several Himalayan species have been observed.

Pteris quadriaurita Retz.: Fl. E. Himal. 466 (1966); **2**: 207 (1971).

NEPAL. Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Phulchoki, ca 1300 m (Jul. 15, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Observatory Hill, 2000 m (Jul. 24, 1972); Ubayuri-dani, 2200 m (Jul. 25, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9. 1972).

This is another complex species, and the identification for this species should be tentative.

Pteris setuloso-costulata Hayata: Fl. E. Himal. 467 (1966); **2**: 207 (1971).

DARJEELING. Raman–Rimbick, 1900–2400 m (Aug. 5, 1972); Palmajua, 2200 m (Aug. 7, 1972).

It is rather tentative to refer the above materials to this Formosan species, and it is highly necessary to revise this species group as a whole.

Pteris venusta Kunze: Fl. E. Himal. 467 (1966).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972).

Distr. Himalaya, Burma, Thailand, Malaysia, Indo-China, and Formosa.

Pteris vittata L.: Fl. E. Himal. 467 (1966); **2**: 207 (1971).

NEPAL. Mohamabedi Khola, 400 m (Jun. 3, 1972).

Pteris Wallichiana Ag.: Fl. E. Himal. 467 (1966); **2**: 207 (1971)–Banerji, l.c. 270 (1972).

NEPAL. Hile–Mure, 1900–2100 m (Jun. 5, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972).

Distr. N. India through China to Japan, and south to W. Malaysia.

Sphenomeris chinensis (L.) Maxon in Journ. Wash. Ac. Sci. **3**: 144 (1913)–Banerji, l.c. 272 (1972)–Kramer in Gard. Bull. Sing. **26**: 4 (1972).

Trichomanes chinensis L., Sp. Pl. ed. 1, **2**: 1099 (1753).

Sphenomeris chusana (L.) Copel.: Fl. E. Himal. 467 (1966).

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

DARJEELING. East Side, 2100 m (Jul. 23, 1972); Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972).

DAVALLIACEAE

Araiostegia dareiformis (Hook.) Copel.: H. Ito in Fl. E. Himal. 468 (1966)–Banerji in Candollea **27**: 272 (1972).

NEPAL. Shewaden–Mewa Khola, ca 2300 m (Jun. 29, 1972); Chauke–Dor, 2600–2900 m (Jul. 6, 1972).

DARJEELING. Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. Ceylon, Himalaya, N. Thailand, Tonkin, S. W. China, and Hainan.

Araiostegia Delavayi (Bedd. ex Clarke et Baker) Ching in Fl. Reip. Pop. Sin. **2**: 289 (1959)–Alston & Bonner in Candollea **15**: 210 (1956).

Davallia pulchra var. *Delavayi* Bedd. ex Clarke et Baker in Journ. Linn. Soc. **2**: 410 (1888).

DARJEELING. Phalut–Raman, ca 2200 m (Aug. 4, 1972).

Distr. Nepal, Sikkim, Assam, and Yunnan.

Araiostegia Hookeri (Moore ex Bedd.) Ching in Fl. Reip. Pop. Sin. **2**: 291 (1959).

Acrophorus Hookeri Moore ex Bedd., Ferns Brit. Ind. t. 95 (1865).

Leucostegia Hookeri (Moore ex Bedd.) Bedd., Handb. 52 (1883).

Davallia Clarkei Baker in Hook. et Baker, Syn. Fil. ed. 2, 91 (1874).

Araiostegia Clarkei (Baker) Copel. in Philip. Journ. Sci. **34**: 241 (1927).

NEPAL. Thudam, 3400 m (Jun. 22, 1972).

Distr. Himalaya to Tibet, and S.W. China (Szechuan and Yunnan).

Araiostegia multidentata (Hook. et Baker) Copel. in Philip. Journ. Sci. **34**: 241 (1927).

Aspidium multidentatum Wall., List 346 (1828), nom. nud.

Davallia multidentata Hook. et Baker, Syn. Fil. 91 (1867).

Leucostegia multidentata (Hook. et Baker) Bedd., Ferns Brit. Ind. Suppl. 4 (1876); Handb. 50 (1883).

Humata assamica (Bedd.) C. Chr. sensu H. Ito in Fl. E. Himal. 469 (1966).

NEPAL. Papung, 2100 m (Jun. 29, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

DARJEELING. Phalut–Raman, ca 2100 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Distr. Himalaya to S.W. China (Szechuan and Yunnan).

Araiostegia pulchra (Don) Copel.: Fl. E. Himal. 468 (1966)–Banerji, l.c. 271 (1972).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Mangalbare–Mul Pokhari, 2600–2900 m (Jun. 8, 1972); Mewa Khola–Papung, ca 2200 m (Jun. 29, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972); Chauke–Tinjure Phedi, 2700 m (Jul. 6, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

DARJEELING. Lloyd Botanic Garden, 2100 m (Jul. 26, 1972); Tonglu–Sandakphu, ca 3000 m (Jul. 31, 1972); Phalut–Raman, ca 2200 m (Aug. 4, 1972); Lopchu, ca 800 m (Aug. 10, 1972).

Davallia trichomanoides Blume: Fl. E. Himal. 469 (1966).

NEPAL. Kathmandu, ca 1300 m (May 28, 1972); Sanguri Bhanjyang–Dhara Pani, ca 1250 m (Jun. 2, 1972).

Distr. Ceylon, Himalaya to Malaysia throughout east to New Guinea.

Davallodes membranulosum (Wall. ex Hook.) Copel. in Philip. Journ. Sci. **34**: 245 (1927)–Ching in Fl. Reip. Pop. Sin. **2**: 282, pl. 21, f. 7, 8 (1959).

Davallia membranulosa Wall. ex Hook., Sp. Fil. **1**: 158, t. 53 A (1846).

Leucostegia membranulosa (Wall. ex Hook.) J. Smith, Hist. Fil. 84 (1857)–Bedd., Handb. 50 (1883).

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Distr. Himalaya to Yunnan, N. Thailand, and Tonkin.

Leucostegia immersa (Wall. ex Hook.) Presl: Fl. E. Himal. 469 (1966)–Banerji, l.c. 272 (1972).

NEPAL. Papung, 2000 m (Jun. 29, 1972); Tute–Basantapur, 2300 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Distr. S. India, E. Himalaya, S.W. China, Burma, Thailand, Indo-China, W. Malaysia to the Philippines, and north to Formosa.

Nephrolepis cordifolia (L.) Presl: Fl. E. Himal. 469 (1966); **2**: 208 (1971)–Banerji, l.c. 272 (1972).

NEPAL. Sanguri Bhanjyang–Dhara Pani, ca 1250 m (Jun. 2, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Distr. Pantropic, extending north to S. Japan, and south to New Zealand.

Nephrolepis delicatula (Decne.) Pichi-Ser. in Webbia **23**: 181 (1968).

Nephrodium delicatulum Decne. in Jacq., Voy. Ind. Bot. **4**: 178, t. 179 (1844).

NEPAL. Dingla–Doban, 800–1000 m (Jul. 2, 1972).

Distr. Himalaya, India, Burma, Thailand, and Yunnan.

Oleandra pistillaris (Sw.) C. Chr., Ind. Fil. Suppl. III, 132 (1934).

Aspidium pistillare Sw. in Schrad. Journ. Bot. **1800** (2): 30 (1802).

O. neriiformis Cav.: Fl. E. Himal. **2**: 208 (1971).

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Sanguri Bhanjyang–Dharan, ca 1200 m (Jul. 10, 1972).

Oleandra Wallichii (Hook.) Presl: Fl. E. Himal. 469 (1966)–Banerji, l.c. 272 (1972).

NEPAL. Mangalbare–Mul Pokhari, 2600–2900 m (Jun. 8, 1972); Mewa Khola–Papung, ca 2200 m (Jun. 29, 1972); Chauke–Tinjure Phedi, 2700 m (Jul. 6, 1972); Phulchoki, ca 2300 m (Jul. 15, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, ca 2400 m (Aug. 4, 1972).

Distr. Himalaya, Burma, Thailand, Indo-China, S.W. China, and Formosa.

PLAGIOGYRIACEAE

Plagiogyria communis Ching in Act. Phytotax. Sin. **7**: 122 (1958)–Banerji in Candollea **27**: 268 (1972).

P. pycnophylla (Kunze) Mett.: H. Ito in Fl. E. Himal. 470 (1966); **2**: 208 (1971).

NEPAL. Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972).

DARJEELING. Tonglu–Sandakphu, ca 3000m (Jul. 31, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Distr. Himalaya, Upper Burma, N. Thailand, and S.W. China.

CYATHEACEAE

Cyathea chinensis Copel. in Philip. Journ. Sci. (Bot.) **3**: 355 (1909)–Holtt. in Kew Bull. **19**: 466 (1965).

C. Brunoniana (Hook.) Clarke et Baker: Tagawa in Fl. E. Himal. 470 (1966).

DARJEELING. Victoria Fall, 2100 m (Jul. 24, 1972); Rimbick–Palmajua, 1500–2200m (Aug. 6, 1972).

Distr. Himalaya to Yunnan, N. Thailand, and Indo-China.

Cyathea spinulosa Wall. ex Hook.: Tagawa in Fl. E. Himal. 470 (1966); K. Iwatsuki in **2**: 208 (1971)–Banerji in Candollea **27**: 273 (1972).

NEPAL. Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972).

Distr. S. India and E. Himalaya to S. Japan.

ASPIDIACEAE

Acrophorus stipellatus Moore: H. Ito in Fl. E. Himal. 470 (1966).

NEPAL. Topke Gola–Shewaden, ca 3200 m (Jun. 28, 1972).

DARJEELING. Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972); Phalut–Raman, ca 2100 m (Aug. 4, 1972).

Arachniodes assamica (Kuhn) Ohwi: H. Ito in Fl. E. Himal. 471 (1966).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Himalaya, Burma, N. Thailand, Tonkin, S.W. China, and Japan.

Arachniodes nipponica (Rosenst.) Ohwi in Journ. Jap. Bot. **37**: 76 (1962).

Polystichum nipponicum Rosenst. in Fedde, Rep. **13**: 130 (1914).

Rumohra nipponica (Rosenst.) Ching in Sinensia **5**: 50 (1934).

DARJEELING. Phalut–Raman, ca 2200 m (Aug. 4, 1972).

Distr. Himalaya, E. Burma, Kweichow, and Japan.

Arachniodes spectabilis (Ching) Ching: Fl. E. Himal. 471 (1966); **2**: 208 (1971).

NEPAL. Shewaden–Papung, ca 2200 m (Jun. 29, 1972).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. E. Himalaya, E. Burma, N. Thailand, and Yunnan.

It is not evident at present whether *A. spectabilis* is distinct from *A. coniifolia*, and the identification is given here comparing with the definition given by Ching in 1934, for I have not examined the type specimens for both of these species. The position of sori is various, some being terminal and the others dorsal on veinlets. At the base of stipe are "a dense tuft of rufo-brown, soft, linear-fibrillose, tortuous scales".

Athyrium[1] **allantoides** Bedd., Ferns Brit. Ind. t. 221 (1867).

Athyrium thelypteroides (Michx.) Desv., Prodr. 266 (1827)–Bedd., Handb. 164 (1883).

NEPAL. Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972); Thudam-Kipudonsu, 3800 m (Jun. 26, 1972); Topke Gola–Shewaden, 3000 m (Jun. 28, 1972); Phulchoki, 2300 m (Jul. 15, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972); Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972); Sandakphu, 3600 m (Aug. 1, 1972); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

Distr. Himalaya (Kashmir to Bhutan).

Athyrium anisopterum Christ in Bull. Herb. Boiss. **6**: 962 (1898)–Alston & Bonner in Candollea **15**: 214 (1956).

NEPAL. Mangalbare–Mul Pokhari, 2600–2900 m (Jun. 8, 1972); Shewaden–Papung, 2400 m (Jun. 29, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972).

DARJEELING. East Side, 2100 m (Jul. 23, 1972); Tonglu–Sandakphu, 2800 m (Jul. 31, 1972); Phalut–Raman, 2200 m (Aug. 4, 1972); Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972).

Distr. Himalaya, N. Thailand, and S. China.

Athyrium Atkinsoni Bedd.: Tagawa in Fl. E. Himal. 471 (1966).

NEPAL. Thudam, 3400 m (Jun. 22, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972).

Athyrium attenuatum (Clarke) Tagawa in Act. Phytotax. Geobot. **16**: 177 (1956).

Asplenium filix-femina var. *attenuatum* Clarke in Tr. Linn. Soc. II. Bot. **1**: 492, pl. 59, f. 1 (1880).

Athyrium filix-femina var. *attenuatum* (Clarke) Bedd., Handb. 169 (1883).

NEPAL. Tinjure Phedi–Chauke, 2700 m (Jun. 7, 1972).

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[1] *Athyrium* is abundantly represented in E. Himalaya, but the classification has not yet been thoroughly revised. I tried to recognize the specific identity in the field, but it is necessary to examine a great number of authenticated specimens before fixing the identification. It is quite regrettable that the list of *Athyrium* species given here is tentative and we have to wait further investigation for the materials included here.

Distr. Kashmir, Nepal, and Sikang.

Athyrium drepanopterum (Kunze) A. Br. ex Milde: Fl. E. Himal. 471 (1966).

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972).

Athyrium Duthiei Bedd., Handb. Suppl. 34 (1892)–Alston & Bonner, l.c. 214 (1956).

Asplenium Duthiei Bedd. in Journ. Bot. **1889**: 72 (1889).

NEPAL. Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Topke Gola, 3600 m (Jun. 16, 1972); Thudam–Lama Chungbu, 3400–4200 m (Jun. 23 & 24, 1972); Thudam–Kipudonsu, ca 3800 m (Jun. 26, 1972).

Distr. Himalaya, 3400–4200 m alt.

Athyrium falcatum Bedd., Ferns S. Ind. t. 151 (1863)–Alston & Bonner, l.c. 214 (1956).

Asplenium drepanophyllum Baker in Hook. et Baker, Syn. Fil. ed. 2, 226 (1874), non Kunze (1834).

Athyrium drepanophyllum Bedd., Handb. Suppl. 32 (1892).

NEPAL. Gopte–Thale Patil, 3200–3400 m (Aug. 26, 1972).

Distr. India and Nepal.

Athyrium filix-femina (L.) Roth, Tent. Fl. Germ. **3**: 65 (1799).

var. **dentigerum** (Wall. ex Clarke) Bedd., Handb. 169 (1883).

Asplenium filix-femina var. *dentigerum* Clarke in Tr. Linn. Soc. II. Bot. **1**: 492 (1880).

NEPAL. Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972).

Distr. Himalaya (Kashmir to Bhutan).

It is probable that the specimen identified as *A. attenuatum* above belongs to this species as a variety, especially comparing with the materials from Darjeeling.

var. **retusa** (Decne.) Bedd., Handb. 170 (1883).

Cystopteris retusa Decne. in Jacq., Voy. Bot. 176, t. 177 (1844).

Asplenium filix-femina var. *retusa* (Decne.) Clarke in Tr. Linn. Soc. II. Bot. **1**: 492, pl. 49, f. 2 (1880).

NEPAL. Thudam, 3400 m (Jun. 22 & 25, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972).

SIKKIM. Chia Bhanjyang–Phalut, 3100–3500 m (Jun. 2, 1960).

Distr. Himalaya (Kashmir to Bhutan, 3000–4500 m alt.).

This identification is tentative, as I have never seen the type materials of this variety. However, the ferns identified as this as enumerated above form a distinct taxon especially indicated by dense broadly oblong scales at base of stipes bicoloured with ebenous central portion and brown margin.

Athyrium foliolosum Moore apud Bedd., Handb. Suppl. 37 (1892); Fl. E. Himal. 471 (1966).

NEPAL. Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Lamo Pokhari, 2900 m (Jun. 9, 1972); Topke Gola–Shewaden, ca 3300 m (Jun. 28, 1972); Shewaden–Papung, ca

2400 m (Jun. 29, 1972); Chauke–Tinjure Phedi, 2700 m (Jul. 6, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972); Phalut–Raman, 2100–3600 m (Aug. 4, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Distr. Himalaya to Yunnan.

Athyrium nigripes (Blume) Moore: Fl. E. Himal. 472 (1966).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Chitre–Dor, 2300–2600 m (Jun. 6, 1972); Tute, 2300 m (Jun. 6, 1972); Kokim Pokhari–Hati Surde, 3000–3600 m (Jun. 11, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972); Shewaden–Papung, ca 2400 m (Jun. 29, 1972); Tinjure Phedi–Tinjure, 2700–2900 m (Jul. 6, 1972); Chitre–Hile, 1900–2400 m (Jul. 8, 1972).

DARJEELING. East Side, 2100 m (Jul. 23, 1972); Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, 2100–3600 m (Aug. 4, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

The identification of our materials to this species is rather doubtful even after a comprehensive revision of this species group by Sledge in Ann. Mag. Nat. Hist. ser. 12, **9**: 453–464 (1956).

Athyrium pectinatum (Wall. ex Mett.) Bedd.: Fl. E. Himal. 472 (1966).

NEPAL. Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972).

Athyrium puncticaule (Blume) Moore, Ind. Fil. 186 (1860)–Alston & Bonner, l.c. 213 (1956).

Aspidium puncticaule Blume, Enum. Pl. Jav. 159 (1828).

Athyrium macrocarpum (Blume) Bedd.: Fl. E. Himal. 471 (1966).

NEPAL. Bhalukhop–Chitre, 2400 m (Jun. 5, 1972); Shewaden–Papung, 2200 m (Jun. 29, 1972); Tute–Basantapur, 2300 m (Jul. 7, 1972); Chitre–Hile, 1900–2400 m (Jul. 8, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Victoria Fall, 2100 m (Jul. 24, 1972); East Side, 2100 m (Jul. 25, 1972); Phalut–Raman, 2300 m (Aug. 4, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972); Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972); Palmajua, 2200 m (Aug. 7, 1972); Palmajua–Batasi, 2100–2200 m (Aug. 8, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Himalaya to continental S.E. Asia to W. Malaysia.

Athyrium Schimperi (A. Br.) Moug. ex Fée, Gen. Fil. 187 (1852)–Alston & Bonner, l.c. 214 (1956).

Asplenium Schimperi A. Br. in Shweinf. Beitr. **1**: 224 (1867).

DARJEELING. Phalut–Raman, 2200–2300 m & ca 2800 m (Aug. 4, 1972).

Distr. Abyssinia and Himalaya.

Athyrium setiferum C. Chr., Ind. Fil. 146 (1905).

Asplenium tenellum (Wall.) Hope in Journ. Bomb. Nat. Hist. Soc. **12**: 529, t. 4 (1899), non Roxb. (1816) nec Fée (1852.)

NEPAL. Walunchung Gola–Zongri, 2700–3200 m (Nov. 11, 1963); Zongri–Iladanda, 1800–2600 m (Nov. 12, 1963); Thakuma Khola–Yamphodin, 2000–3500 m (Nov. 17, 1963); Tute–Dor, 2300–2600 m (Jun. 6, 1972); Mangalbare–Mul Pokhari, 2600–2900 m (Jun. 8, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

Distr. Himalaya to Yunnan and N. Thailand.

Athyrium strigillosum Moore: Fl. E. Himal. 472 (1966).

Nepal. Hile–Mure, ca 1950 m (Jun. 5, 1972).

Athyrium subtriangulare (Hook. ex Hook. et Baker) Bedd.: Fl. E. Himal. **2**: 209 (1971).

Nepal. Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Athyrium Wallichianum Ching in Bull. Fan Mem. Inst. Biol. **8**: 497 (1938)–Alston & Bonner in Candollea **15**: 213 (1956).

Aspidium Brunonianum Wall. ex Mett., Pheg. Aspid. 54 (1858).

Lastrea Brunoniana (Wall. ex Mett.) Presl ex Bedd., Ferns Brit. Ind. t. 37 (1865); Handb. 246 (1883); Suppl. 55 (1892)–Clarke in Tr. Linn. Soc. II. Bot. **1**: 522 (1880)–Hope in Journ. Bomb. Nat. Hist. Soc. **14**: 731 (1903).

Nepal. Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972); Lama Chungbu–Samdan, 3200–4400 m (Jun. 24, 1972); Thudam–Kipudonsu, ca 3800 m (Jun. 26, 1972).

Distr. Himalaya and Yunnan.

Bolbitis appendiculata (Willd.) K. Iwats. in Act. Phytotax. Geobot. **18**: 48 (1959).

Acrostichum appendiculatum Willd., Sp. Pl. **5**: 114 (1810).

Polybotrya appendiculata (Willd.) J. Smith in Journ. Bot. **4**: 150 (1841)–Bedd., Handb. 424 (1883).

Darjeeling. Near Lopchu, 800 m (Aug. 10, 1972).

Distr. E. Himalaya, S. China to Malaysia throughout, and north to Ryukyus.

Bolbitis contaminans (Clarke) Ching in C. Chr., Ind. Fil. Suppl. III, 47 (1934).

Acrostichum crispatulum var. *contaminans* Clarke in Tr. Linn. Soc. II. Bot. **1**: 580 (1880).

Gymnopteris contaminas (Clarke) Bedd., Handb. 435 (1883), nom. sol.

Nepal. Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972).

Distr. Himalaya, Thailand, and Formosa.

Cornopteris opaca (Don) Tagawa: Tagawa in Fl. E. Himal. 473 (1966).

Darjeeling. Phalut–Raman, 2100 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Cornopteris sp., aff. *C. fluvialis* (Hayata) Tagawa.

Nepal. Shewaden–Papung, 2400 m (Jun. 29, 1972).

Darjeeling. Phalut–Raman, 2100 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972).

This is a species similar to *C. fluvialis* (Hayata) Tagawa of Formosa and Japan. There are several species reported from S.W. China for the genus *Cornopteris*; *C. badia* from Yunnan, *C. likiangensis* from Yunnan, *C. omeigensis* from Szechuan and *C. Tsangii* from Kwangtung, all described by Ching and I had no chance to examine the authenticated specimens of these species. The present materials may warrant a description of another species, though we might better make thorough investigation for ever-described species.

Ctenitis apiciflora (Wall. ex Mett.) Ching in Bull. Fan Mem. Inst. Biol. **8**: 284 (1938).

Dryopteris apiciflora (Wall. ex Mett.) O. Ktze.: H. Ito in Fl. E. Himal. 475 (1966).

NEPAL. Shewaden–Papung, ca 2500 m (Jun. 29, 1972).

Ctenitis Clarkei (Baker) Ching in Bull. Fan Mem. Inst. Biol. **8**: 287 (1938).

Dryopteris Kawakamii Hayata sensu H. Ito in Fl. E. Himal. 477 (1966); **2**: 210 (1971).

NEPAL. Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972).

Distr. Himalaya.

Ctenitis nidus (Clarke) Ching in Bull. Fan Mem. Inst. Biol. **8**: 287 (1938)–Banerji in Candollea **27**: 274 (1972).

Nephrodium nidus Clarke in Journ. Linn. Soc. **15**: 156 (1876).

Lastrea filix-mas var. *patentissima* subvar. *nidus* (Clarke) Bedd., Handb. 250 (1883).

NEPAL. Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Thudam, 3400 m (Jun. 22 & 25, 1972); Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972).

DARJEELING. Tonglu–Sandakphu, ca 3000 m (Jul. 31, 1972); Sandakphu, 3600 m (Aug. 1, 1972).

Distr. E. Himalaya and Yunnan.

Cyrtomium Hookerianum (Presl) C. Chr.: H. Ito in Fl. E. Himal. 473 (1966).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, ca 2100 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Cystopteris fragilis (L.) Bernh. in Schrad. Journ. Bot. **1** (2): 26 (1806)–Bedd., Handb. 70 (1883)–Alston & Bonner in Candollea **15**: 212 (1956).

NEPAL. Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Lama Chungbu–Samdan, 4200–4400 m (Jun. 24, 1972); Phujeng La–Topke Gola, 3600–4800 m (Jun. 27, 1972); Topke Gola–Shewaden, 3300 m (Jun. 28, 1972).

Distr. S. Europe, Atlantic Isles, Mascarenes, N. Asia, Himalaya, Japan, and tropical America.

Cystopteris sudetica A. Br. et Milde var. **moupinensis** (Franch.) Blasdell in Mem. Torrey Bot. Club **21** (4): 45 (1963).

Cystopteris moupinensis Franch. in Nouv. Arch. Mus. II. **10**: 111 (1887).

NEPAL. Topke Gola–Shewaden, 3300 m (Jun. 28, 1972).

Distr. E. Himalaya and C. & S.W. China to Formosa.

Cystopteris tenuisecta (Blume) Mett.: H. Ito in Fl. E. Himal. 473 (1966).

NEPAL. Dor–Chauke, 2600–2900 m (Jun. 7, 1972); Shewaden–Papung, 2200 m (Jun. 29, 1972).

DARJEELING. Phalut–Raman, 2100 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Diacalpe aspidioides Blume: H. Ito in Fl. E. Himal. 473 (1966); **2**: 209 (1971).

NEPAL. Shewaden–Papung, ca 2200 m (Jun. 29, 1972).

DARJEELING. Phalut–Raman, ca 2400 m (Aug. 4, 1972).

Distr. Ceylon, India, Himalaya, N. Thailand, S.W. China, Hainan, and Malaysia.

Diplaziopsis javanica (Blume) C. Chr.: Tagawa in Fl. E. Himal. 473 (1966).

DARJEELING. Lopchu, 1000 m (Aug. 10, 1972).

Distr. Ceylon, Himalaya to Malaysia throughout to S. Pacific Island, and north to Japan.

Diplazium bellum (Clarke) Tagawa: Tagawa in Fl. E. Himal. 474 (1966).

SIKKIM. Yoksam–Bakkim, 1700–2200 m (May 18, 1960–T).

Diplazium esculentum (Retz.) Sw.: Fl. E. Himal. 474 (1966).

NEPAL. Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972).

Diplazium giganteum (Baker) Ching: Fl. E. Himal. 474 (1966).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Ubayuri-dani, 2200 m (Jul. 25, 1972); Raman–Rimbick, 2200–2400 m (Aug. 5, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Diplazium muricatum (Mett.) v. A. v. Ros.: Fl. E. Himal. 474 (1966).

NEPAL. Helok–Iladanda, 1500–1800 m (Nov. 8, 1963); Bhuspate Danra–Mai Majuwa, 1600–3100 m (Dec. 3, 1963); Mai Majuwa–Dhara Pani, 1500–1600 m (Dec. 4, 1963).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

SIKKIM. Yoksam–Preig Chu, 1700–2200 m (May 18, 1960–T).

Distr. Ceylon, Himalaya, N. Thailand, S.W. China, Formosa, and south to Java.

Diplazium polypodioides Blume, Enum. Pl. Jav. 194 (1828)–Bedd., Handb. 184, f. 89 (1883).

D. asperum Blume, Enum. Pl. Jav. 195 (1828)–Bedd., Handb. 184, f. 88 (1883).

NEPAL. Dhankuta–Sinduwa, 1200–2100 m (Oct. 22, 1963); Sinduwa, 2100 m (Oct. 23, 1963); Mul Pokhari–Dumhan, 700–2500 m (Oct. 30, 1963); Tuwa–Taplethok, 1400–1800 m (Nov. 5, 1963); Taplethok–Helok, 1400–1500 m (Nov. 6, 1963); Helok–Iladanda, 1500–1800 m (Nov. 8, 1963); Zongi–Iladanda, 1800–2800 m (Nov. 12, 1963); Ghatte-Khebang, 1700–2400 m (Nov. 19, 1963)*; Khebang-below Siling Tzokupa, 1700–2100 m (Nov. 20, 1963); Khebang, 1400 m (Nov. 23, 1963); Birwa–Yektin, 1700–2800 m (Nov. 28, 1963)*; Yektin–Akasay, 1400–2300 m (Nov. 30, 1963)*; Illam–Ranga Pani, 300 m (Dec. 8, 1963); Ghorwa–Sanichare, 200 m (Dec. 10, 1963).

DARJEELING. Palmajua–Rimbick, 2200–2300 m (May 5, 1960–T)*; Phalut–Raman, 2100 m (Aug. 4, 1972)*.

Distr. Ceylon, S. India, Himalaya, Burma, Thailand, Indo-China, S.W. China, Formosa, and Malaysia throughout.

All or a part of the specimens with an asterisk belong to var. *vestitum* named by Clarke (1880), though the specific classification is hardly successful for *D. polypodioides* by our informations at hand.

Diplazium spectabile (Wall. ex Mett.) Ching: Fl. E. Himal. 475 (1966).

NEPAL. Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

Diplazium Stoliczkae Bedd.: Fl. E. Himal. 475 (1966).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Shewaden–Papung, 2000–2600 m (Jun. 29, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972); Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Raman–Rimbick, 1000–2400 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Diplazium viridissimum Christ in Not. Syst. **1**: 45 (1909).

NEPAL. Dingla–Doban, 800–1000 m (Jul. 2, 1972).

Distr. Himalaya (Nepal) and Yunnan.

Dryoathyrium Boryanum (Willd.) Ching: Tagawa in Fl. E. Himal. 475

(1966); K. Iwatsuki in **2**: 209 (1971).

Nepal. Phulchoki, 2200–2700 m (Jul. 15, 1972); Shewaden–Papung, 2400 m (Jun. 29, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972).

Darjeeling. Phalut–Raman, 2100 m (Aug. 4, 1972); Palmajua, 2200 m (Aug. 7, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Dryopteris atrata (Wall. ex Kunze) Ching: H. Ito in Fl. E. Himal. 475 (1966); **2**: 209 (1971)–Banerji in Candollea **27**: 274 (1972).

Darjeeling. Palmajua, 2200 m (Aug. 7, 1972).

Dryopteris barbigera (Moore) O. Ktze.: Fl. E. Himal. 475 (1966), nom. sol.

Nepal. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972); Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Thudam–Lama Chungbu, 3400–4200 m (Jun. 23, 1972); Gopte–Thale Patil, 3200–3500 m (Aug. 26, 1972).

Darjeeling. Phalut–Singalila, 3600–3700 m (Aug. 3, 1972).

Sikkim. Chia Bhanjyang–Phalut, 3100–3500 m (Jun. 2, 1960).

Dryopteris chrysocoma (Christ) C. Chr.: Fl. E. Himal. 476 (1966)–Banerji, l.c. 274 (1972).

D. barbigera (Moore) O. Ktze. sensu H. Ito in Fl. E. Himal. 475 (1966).

D. marginata (Wall.) Christ sensu H. Ito in Fl. E. Himal. 477 (1966).

D. odontoloma (Moore) C. Chr. sensu H. Ito in Fl. E. Himal. 477 (1966).

Nepal. Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Mangalbare–Mul Pokhari, 2600–2900 m (Jun. 8, 1972); Thudam, 3400 m (Jun. 22, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Tute–Basantapur, 2300 m (Jul. 7, 1972).

Darjeeling. East Birch Hill Road, 2100 m (Jul. 22, 1972); Ubayuri-dani, 2200 m (Jul. 25, 1972); Lloyd Botanic Garden, 2100 m (Jul. 26, 1972); Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972); Phalut–Raman, ca 3000 m (Aug. 4, 1972).

Dryopteris cochleata (Don) C. Chr.: Fl. E. Himal. 476 (1966)–Banerji, l.c. 274 (1972).

Nepal. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

Distr. Himalaya to W. Malaysia.

Dryopteris marginata (Wall. ex Christ) Christ: Fl. E. Himal. 477 (1966), nom. sol.

Nepal. Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Darjeeling. Batasi-Mani Bhanjyang, 2000-2100 m (Aug. 9, 1972).

Distr. Ceylon, Himalaya, and Formosa.

Dryopteris odontoloma (Moore) C. Chr.: Fl. E. Himal. 477 (1966), nom. sol.

D. hypophlebia Hayata: Fl. E. Himal. 477 (1966); **2**: 210 (1971).

D. lepidopoda Hayata sensu H. Ito in Fl. E. Himal. 477 (1966); **2**: 210 (1971).

Nepal. Phulchoki, 2200–2700 m (May 28 & Jul. 15, 1972); Mure–Sinduwa, 2100 m (Jun. 5, 1972).

Darjeeling. East Birch Hill Road, 2100 m (Jul. 22, 1972); East Side, 2100 m (Jul. 23, 1972).

Dryopteris hypophlebia of Formosa was recognized by Tagawa in Act. Phytotax. Geobot. **8**: 24 (1939) summarizing the difference between this and Himalayan *D. odontoloma*. These two are, however, hardly separable with variation in both the areas and might better be united specifically. H. Ito distinguished these two and referred the Himalayan collections to Formosan species in the previous reports.

Dryopteris paleacea (Sw.) C. Chr.: Fl. E. Himal. 477 (1966); **2**: 210 (1971).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972); Tinjure–Dor, 2600–2900 m (Jul. 6, 1972); Chitre–Hile, 1900–2400 m (Jul. 8, 1972); Latsu–Bhorlang, 1700–2400 m (Aug. 30, 1972).

DARJEELING. Tonglu–Sandakphu, ca 3000 m (Jul. 31, 1972); Phalut–Raman, ca 2600 m (Aug. 4, 1972).

Distr. Widely distributed in the warmer parts of the world.

Dryopteris panda (Clarke) C. Chr.: Fl. E. Himal. 478 (1966).

NEPAL. Hile–Mure, 1900–2100 m (Jun. 5, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

Dryopteris pulvinulifera (Bedd.) O. Ktze., Rev. Gen. Pl. **2**: 213 (1891)–Ching in Bull. Fan Mem. Inst. Biol. **8**: 466 (1938).

Lastrea pulvinulifera Bedd., Ferns Brit. Ind. t. 333 (1870); Handb. 255 (1883); Suppl. 60 (1892).

Dryopteris Harae H. Ito in Fl. E. Himal. 476, pl. 26 (1966).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972).

Distr. Ceylon, Sikkim, and Assam.

Dryopteris serrato-dentata (Bedd.) Hayata: Fl. E. Himal. 478 (1966)–Banerji, l.c. 274 (1972).

NEPAL. Gosa–Banduke Pokhari, 4100–4200 m (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4000–4200 m (Jun. 15, 1972); Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Janga La–Thudam, ca 3700 m (Jun. 21, 1972); Thudam, 3400 m (Jun. 22 & 25, 1972); Thudam–Kipudonsu, 3400–4200 m (Jun. 26, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972).

Dryopteris sino-fibrillosa Ching in Bull. Fan Mem. Inst. Biol. **10**: 180 (1940).

D. fibrillosa (Clarke) Hand.-Mzt. in Akad. Anz. Akad. Wiss. Wien **1922**: 2 (1922), non (Baker) C. Chr. (1905)–Ching in Bull. Fan Mem. Inst. Biol. **8**: 424 (1938)–Alston & Bonner in Candollea **15**: 216 (1956).

Nephrodium filix-mas var. *fibrillosum* Clarke in Tr. Linn. Soc. II. Bot. **1**: 520, pl. 70 (1880).

Lastrea filix-mas var. *parallelogramma* subvar. *fibrillosa* (Clarke) Bedd., Handb. 250 (1883).

NEPAL. Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972).

Distr. Himalaya to S.W. China.

Dryopteris sparsa (Don) O. Ktze.: Fl. E. Himal. 478 (1966); **2**: 210 (1971).

D. Hasseltii (Blume) C. Chr. sensu H. Ito in Fl. E. Himal. 477 (1966).

NEPAL. Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972).

Dryopteris splendens (Hook.) O. Ktze., Rev. Gen. Pl. **2**: 813 (1891)–Ching in Bull. Fan Mem. Inst. Biol. **8**: 452 (1938).

Nephrodium splendens Hook., Sp. Fil. **4**: 126 (1862).

Lastrea splendens (Hook.) Bedd.: Bedd., Handb. 262 (1883).

D. reflexosquamata Hayata sensu H. Ito in Fl. E. Himal. 478 (1966).

Nepal. Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972); Shewaden–Papung, ca 2500 m (Jun. 29, 1972).

Darjeeling. Tonglu–Sandakphu, ca 2800 m (Aug. 31, 1972).

Distr. Himalaya and S.W. China.

Elaphoglossum marginatum (Wall. ex Fée) Moore, Ind. Fil. ii (1857), 361 (1862)–Alston et Bonner in Candollea **15**: 215 (1956).

Acrostichum marginatum Wall. ex Fée, Mém. **2**: 31 (1845).

E. conforme (Sw.) Schott: H. Ito in Fl. E. Himal. 479 (1966).

Nepal. Shewaden–Papung, ca 2100 m (Jun. 29, 1972).

Darjeeling. Palmajua, 2200 m (Aug. 7, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Himalaya, Thailand, Indo-China, Yunnan, and Formosa.

Elaphoglossum stelligerum (Wall. ex Baker) Moore ex Alston et Bonner in Candollea **15**: 216 (1956)–Sledge in Bull. Brit. Mus. Bot. **4**: 92 (1967).

Acrostichum stelligerum Wall. ex Baker in Hook. et Baker, Syn. Fil. ed. 2, 521 (1874).

E. yunnanense (Baker) C. Chr.: Fl. E. Himal. 479 (1966).

Nepal. Kuwa Pani–Hile, 1900 m (Jun. 4, 1972).

Distr. Himalaya, Burma, N. Thailand, Annam, and S.W. China.

Lithostegia foeniculacea (Hook.) Ching: H. Ito in Fl. E. Himal. **2**: 211 (1971).

Nepal. Shewaden–Papung, 2200 m (Jun. 29, 1972).

Darjeeling. Raman–Rimbick, ca 2400 m (Aug. 5, 1972).

Distr. E. Himalaya and Yunnan.

Lunathyrium japonicum (Thunb.) Kurata in Journ. Geobot. **9**: 99 (1961).

Diplazium japonicum (Thunb.) Bedd.: Tagawa in Fl. E. Himal. 474 (1966).

Nepal. Teku Nala–Hile, 800–1900 m (Jun. 4, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972); Bainse–Sim Chotala, 600–900 m (Aug. 19, 1972).

Darjeeling. East Side, 2100 m (Jul. 23, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972); Lopchu, 800 m (Aug. 10, 1972).

Meniscium proliferum (Retz.) Sw.: K. Iwatsuki in Fl. E. Himal. 479 (1966).

Nepal. Doban–Nessum, 800–1300 m (Jul. 2, 1972).

Peranema cyatheoides Don: H. Ito in Fl. E. Himal. 479 (1966); **2**: 211 (1971)–Banerji in Candollea **27**: 273 (1972).

Nepal. Bhalukhop–Chitre, 2400 m (Jun. 5, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972); Chitre–Teku Nala, 800–2400 m (Jul. 8, 1972); Bhorlang-Sundarijar, 1400–2400 m (Aug. 31, 1972).

Darjeeling. Ubayuri-dani, 2200 m (Jul. 25, 1972); Phalut–Raman, ca 2100 m (Aug. 4, 1972).

Polystichum acanthophyllum (Franch.) Christ: Tagawa in Fl. E. Himal. 480 (1966); **2**: 211 (1971).

Nepal. Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972).

Polystichum Atkinsoni Bedd.: Fl. E. Himal. **2**: 211 (1971).

Nepal. Hile Chok–Ghopte, 3500 m (Jun. 12, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 23, 1972).

Distr. Himalaya and China.

Polystichum Bakerianum (Atkins. ex Baker) Diels in Engl. & Prantl, Nat. Pfl.-fam. **1** (4): 191 (1899).

Aspidium Prescottianum var. *Bakeriana* Clarke in Tr. Linn. Soc. II. Bot. **1**: 510, t. 66 (1880).

P. Prescottianum var. *Bakerianum* (Clarke) Bedd., Handb. 210 (1883).

A. Bakerianum Atkins. ex Baker in Hook., Ic. Pl. t. 1656 (1886).

NEPAL. Thudam, 3400 m (Jun. 24, 1972).

Distr. Sikkim and S.W. China.

Polystichum discretum (Don) Diels: Fl. E. Himal. **2**: 211 (1971).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972).

DARJEELING. Tonglu–Sandakphu, ca 3000 m (Jul. 31, 1972).

Distr. Himalaya to Yunnan.

Polystichum Duthiei (Hope) C. Chr., Ind. Fil. 581 (1906).

Aspidium Duthiei Hope in Journ. Bomb. Nat. Hist. Soc. **12**: 532, t. 6 (1899).

BHUTAN. Barshong–Nala, 3300–3700 m (May 25, 1967).

Distr. N.W. India, Bhutan, S.W. China (Szechuan, Yunnan), and Formosa.

Polystichum lachenense (Hook.) Bedd.: Fl. E. Himal. 480 (1966).

NEPAL. Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972); Topke Gola–Jalang Chhyongo, 3600–4300 m (Jun. 20, 1972); Phujeng La–Topke Gola, 3600–4800 m (Jun. 27, 1972).

Polystichum lentum (Don) Moore: Fl. E. Himal. 480 (1966).

NEPAL. Sanguri Bhanjyang–Dhara Pani, ca 1250 m (Jun. 2, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972).

DARJEELING. Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972); Palmajua, 2200 m (Aug. 7, 1972); Lopchu, 800 m (Aug. 10, 1972).

Polystichum nepalense (Spr.) C. Chr.: Fl. E. Himal. 480 (1966); **2**: 212 (1971).

NEPAL. Dhara Pani–Teku Nala, 300–1000 m (Jun. 3, 1972); Hile–Chitre, 1900–2400 m (Jun. 5, 1972); Tinjure Phedi–Chauke, 2700 m (Jun. 7, 1972).

DARJEELING. Tonglu–Sandakphu, ca 3000 m (Jul. 31, 1972).

var. **subbipinnatum** C. Chr.: Fl. E. Himal. **2**: 212 (1971).

NEPAL. Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Mul Pokhari–Lamo Pokhari, 2900 m (Jun. 8, 1972); Shewaden–Papung, ca 2400 m (Jun. 29, 1972).

Distr. var. E. Himalaya to Yunnan.

Polystichum nigropaleaceum (Christ) Diels in Engl. & Prantl, Nat. Pfl.-fam. **1** (4): 191 (1899)–Banerji in Candollea **27**: 275 (1972).

P. aculeatum var. *nigropaleaceum* Christ in Ber. Schweiz. Bot. Ges. **3**: 26 (1893).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Mul Pokhari–Lamo Pokhari, 2900 m (Jun. 8, 1972); Chauke–Tinjure Phedi, 2700 m (Jul. 6, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 26, 1972).

Distr. Himalaya and China.

Polystichum Prescottianum (Wall. ex Mett.) Moore: Fl. E. Himal. 480

(1866); **2**: 212 (1971)-Banerji, l.c. 274 (1972).

NEPAL. Hile Chok-Gopte, 3500 m (Jun. 12, 1972); Banduke Pokhari-Saju Pokhari, 4000-4200 m (Jun. 15, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972); Thudam-Kipudonsu, 3800 m (Jun. 26, 1972); Topke Gola-Shewaden, ca 3200 m (Jun. 28, 1972); Gosainkund-Gopte, 3500-4400 m (Aug. 25, 1972); Gopte-Thale Patil, 3200-3400 m (Aug. 26, 1972).

DARJEELING. Sandakphu-Phalut, 3200-3600 m (Aug. 2, 1972).

Polystichum punctiferum C. Chr.: Fl. E. Himal. **2**: 212 (1971).

NEPAL. Tute, 2300 m (Jun. 6, 1972); Shewaden-Papung, ca 2200 m (Jun. 29, 1972).

DARJEELING. Phalut-Raman, ca 2300 m (Aug. 4, 1972).

Distr. E. Himalaya, Upper Burma, and Yunnan.

Polystichum semifertile (Clarke) Ching: Fl. E. Himal. **2**: 212 (1971).

NEPAL. Phulchoki, 2200-2700 m (May 28 & Jul. 15, 1972).

DARJEELING. Observatory Hill, 2200 m (Jul. 24, 1972); Ubayuri-dani, 2200 m (Jul. 25, 1972).

Distr. Himalaya, N. Thailand, Yunnan, and Tonkin.

Polystichum squarrosum (Don) Fée: Fl. E. Himal. 481 (1966); **2**: 212 (1971).

NEPAL. Shewaden-Papung, 2200 m (Jun. 29, 1972); Papung-Bir Gaon, 1600-2000 m (Jun. 30, 1972); Phulchoki, 2200-2700 m (Jul. 15, 1972); Sim Chotala-Gram, 900-1900 m (Aug. 20, 1972); Gram-Dunche, 1900-2000 m (Aug. 21, 1972); Dunche-Singum Gompa, 1900-3200 m (Aug. 22, 1972); Latsu-Bhorlang, 1700-2400 m (Aug. 31, 1972).

Polystichum stenophyllum Christ: Fl. E. Himal. 481 (1966); **2**: 212 (1971).

NEPAL. Dor-Tinjure, 2600-2900 m (Jun. 7, 1972); Gosa-Banduke Pokhari, 4100-4200 m (Jun. 14, 1972); Topke Gola-Shewaden, ca 3000 m (Jun. 28, 1972); Chauke-Dor, 2600-2900 m (Jul. 6, 1972).

Polystichum stimulans (Kunze ex Mett.) Bedd.: Fl. E. Himal. 481 (1966); **2**: 212 (1971).

NEPAL. Topke Gola-Shewaden, 2800 m (Jun. 28, 1972).

Polystichum Thomsonii (Hook. f.) Bedd.: Fl. E. Himal. 481 (1966); **2**: 213 (1971).

NEPAL. Phulchoki, 2200-2700 m (May 28 & Jul. 15, 1972); Topke Gola-Shewaden, ca 3000 m (Jun. 28, 1972).

DARJEELING. Tonglu-Sandakphu, ca 3000 m (Jul. 31, 1972).

Tectaria coadunata (Wall. ex Hook. et Grev.) C. Chr.: H. Ito in Fl. E. Himal. 481 (1966); **2**: 213 (1971).

NEPAL. Bir Gaon-Saju Khola, 1400-1600 m (Jul. 1, 1972); Sim Chotala-Gram, 900-1900 m (Aug. 20, 1972).

DARJEELING. Batasi-Mani Bhanjyang, 2000-2100 m (Aug. 9, 1972); Tista, 400 m (Aug. 10, 1972).

Thelypteris arida (Don) Morton: K. Iwatsuki in Fl. E. Himal. 482 (1966). *Cyclosorus aridus* (Don) Tagawa: Banerji in Candollea **27**: 276 (1972).

NEPAL. Bir Gaon-Dingla, 1000-1600 m (Jul. 1, 1972).

Thelypteris auriculata (J. Smith) K. Iwats.: Fl. E. Himal. 482 (1966); **2**: 213 (1971).

NEPAL. Shewaden-Mewa Khola, ca 2400 m (Jun. 29, 1972); Chitre-Hile, 1900-2400 m (Jul. 8, 1972); Gram-Dunche, 1900-2000 m (Aug. 21, 1972).

DARJEELING. Phalut–Raman, ca 2200 m (Aug. 4, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Thelypteris aurita (Hook.) Ching: Fl. E. Himal. 482 (1966); **2**: 213 (1971).

NEPAL. Papung–Bir Gaon, 1900–2000 m (Jun. 30, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972).

Thelypteris erubescens (Wall. ex Hook.) Ching: Fl. E. Himal. 483 (1966); **2**: 213 (1971).

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Thelypteris falciloba (Hook.) Ching in Bull. Fan Mem. Inst. Biol. **6**: 298 (1936).

Lastrea falciloba Hook. in Journ. Bot. Kew Misc. **9**: 337 (1857)–Bedd., Ferns S. Ind. t. 105 (1863).

NEPAL. Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Hile–Mure, 1200–2100 m (Jun. 5, 1972).

Distr. Himalaya, Burma, Indo-China, and China.

var. **latior** Ching in Bull. Fan Mem. Inst. Biol. **6**: 300 (1936).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972).

Distr. var. Formerly known only by the type collection from Assam.

Thelypteris flaccida (Blume) Ching in Bull. Fan Mem. Inst. Biol. **6**: 336 (1936).

Aspidium flaccidum Blume, Enum. Pl. Jav. 161 (1828).

Lastrea flaccida (Blume) Moore, Ind. Fil. 92 (1858)–Bedd., Handb. 240 (1883).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Ceylon, India, Himalaya, N. Thailand, Tonkin, S.W. China, Malaya, Java, and Philippines.

Thelypteris molliuscula (Kuhn) K. Iwats.: Fl. E. Himal. 484 (1966).

NEPAL. Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972); Phulchoki, ca 1500 m (Jul. 15, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

DARJEELING. Lopchu, 800 m (Aug. 10, 1972).

Thelypteris multilineata (Wall. ex Hook.) Morton: Fl. E. Himal. 485 (1966); **2**: 213 (1971).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972); Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

DARJEELING. Lopchu–Tista, 600 m (Aug. 10, 1972).

Thelypteris ornata (Wall. ex Bedd.) Ching: Fl. E. Himal. 485 (1966).

NEPAL. Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972).

DARJEELING. Tista, 400 m (Aug. 10, 1972).

Thelypteris paludosa (Blume) K. Iwats.: Fl. E. Himal. 485 (1966).

NEPAL. Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Topke Gola–Shewaden, 2800 m (Jun. 28, 1972); Tinjure Phedi–Tinjure, 2700–2900 m (Jul. 6, 1972); Chitre–Hile, 1900–2400 m (Jul. 8, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. Phalut–Raman, 2400 m (Aug. 4, 1972); Palmajua–Batasi, 2100–2200 m

(Aug. 8, 1972).

Distr. Himalaya to Polynesia through Malaysia.

var. **glabrata** (Clarke) K. Iwats., comb. nov.

Polypodium distans var. *glabrata* Clarke in Tr. Linn. Soc. II. Bot. **1**: 544 (1880).

DARJEELING. Tonglu–Sandakphu, 2800 m (Jul. 31, 1972).

Distr. var. Sikkim.

Thelypteris rectangularis (Zoll.) K. Iwats., comb. nov.

Polypodium rectangulare Zoll. in Syst. Verz. **1854**: 37, 48 (1854).

Pseudophegopteris rectangularis (Zoll.) Holtt. in Blumea **17**: 19 (1969).

DARJEELING. Tista, 400 m (Aug. 10, 1972).

Distr. Himalaya, Malaya, Sumatra, Java, and Borneo.

Thelypteris repens (Hope) Ching: Fl. E. Himal. **2**: 213 (1971)–Banerji in Candollea **27**: 276 (1972).

NEPAL. Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Phulchoki, ca 1600 m (Jul. 15, 1972).

DARJEELING. East Side, 2100 m (Jul. 23, 1972); Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Himalaya, Tonkin, and S.W. China.

Thelypteris squamistipes (Clarke) Ching in Bull. Fan Mem. Inst. Biol. **6**: 281 (1936).

Polypodium appendiculatum var. *squamistipes* Clarke in Tr. Linn. Soc. II. Bot. **1**: 543, t. 79, f. 2 (1880).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972).

Distr. Formerly known only by the type collection from Darjeeling.

Thelypteris Torresiana (Gaud.) Alston: Fl. E. Himal. 486 (1966).

NEPAL. Dharan–Sanguri Bhanjyang, ca 500 m (Jun. 2, 1972).

DARJEELING. Tista, 400 m (Aug. 10, 1972).

Distr. S.E. Asia to Australia and also naturalized in N. America.

Thelypteris xylodes (Kunze) Ching: Fl. E. Himal. 486 (1966); **2**: 213 (1971).

NEPAL. Bir Gaon–Dingla, 1000–1600 m (Jul. 1, 1972).

Woodsia Andersoni (Bedd.) Christ in Mém. Soc. Bot. France **1**: 45 (1905)–D. Brown in Beih. Nov. Hedw. **16**: 102, pl. 29 (1956).

Gymnogramme Andersoni Bedd., Ferns Brit. Ind., pl. 190 (1868); Handb. 382, f. 219 (1883).

NEPAL. Topke Gola–Jalang Chhyongo, 4000 m (Jun. 20, 1972).

Distr. Himalaya, about 4000 m alt.

Woodsia cycloloba Hand.-Mzt.: H. Ito in Fl. E. Himal. 486 (1966).

NEPAL. Saju Pokhari–Topke Gola, 3600–4400 m (Jun. 16, 1972).

Woodsia elongata Hook., Sp. Fil. **1**: 62 (1844)–D. Brown in Beih. Nov. Hedw. **16**: 80, pl. 14 (1956)–Alston & Bonner in Candollea **15**: 213 (1956).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972); Thudam, 3400 m (Jun. 22, 1972); Lama Chungbu–Thudam, 3400–4200 m (Jun. 24, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

BLECHNACEAE

Woodwardia unigemmata (Makino) Nakai: H. Ito in Fl. E. Himal. 486 (1966); **2**: 214 (1971).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Phalut–Raman, ca 2000 m (Aug. 4, 1972).

ASPLENIACEAE

Asplenium bullatum Wall. ex Mett., Aspl. 150 (1859).

A. bulbiferum Forst. sensu Bedd., Handb. 159 (1883), p.p.

A. pseudolaserpitiifolium Ching ex Tard. et Ching sensu H. Ito in Fl. E. Himal. 488 (1966); **2**: 215 (1971).

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972).

DARJEELING. Tista–Lopchu, ca 600 m (Aug. 10, 1972).

Distr. Himalaya, Tonkin, S.W. China, and Formosa.

Asplenium cheilosorum Kunze: H. Ito in Fl. E. Himal. 486 (1966); **2**: 214 (1971).

DARJEELING. Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972); Lopchu, ca 800 m (Aug. 10, 1972).

Distr. Ceylon, S. India, Himalaya, China, Burma, Indo-China, Thailand, Malaysia throughout, and north to S. Japan.

Asplenium Dalhousiae Hook.: Fl. E. Himal. 487 (1966); **2**: 214 (1971).

DARJEELING. Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972).

Distr. Africa, Afghanistan, and Himalaya.

Asplenium ensiforme Wall. ex Hook. et Grev.: Fl. E. Himal. 487 (1966); **2**: 214 (1971)–Banerji in Candollea **27**: 276 (1972).

NEPAL. Phulchoki, 2200–2700 m (May 28 & Jul. 15, 1972); Sinduwa–Bhalukhop, 2900 m (Jun. 5, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

DARJEELING. Observatory Hill, 2200 m (Jul. 24, 1972); Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. Africa, Ceylon, Himalaya, Burma, Thailand, Indo-China, S.W. China, Formosa, and S. Japan.

Asplenium Finlaysonianum Wall. ex Hook., Ic. Pl. t. 937 (1854).

Hemidictyum Finlaysonianum (Wall. ex Hook.) Moore, Ind. Fil. L (1857)–Bedd., Handb. 195, f. 96 (1883).

Asplenium macrophyllum Sw. sensu H. Ito in Fl. E. Himal. 488 (1966).

NEPAL. Illam–Ranga Pani, 1200–700 m (Dec. 8, 1963); Ranga Pani–Ghorwa, 700–300 m (Dec. 9, 1963); Ghorwa–Sanichare, 300–200 m (Dec. 10, 1963).

Distr. E. Himalaya.

Asplenium laciniatum Don: Fl. E. Himal. 215 (1966); **2**: 215 (1971).

NEPAL. Shewaden–Papung, ca 2200 m (Jun. 29, 1972).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972).

Asplenium tenuifolium Don: Fl. E. Himal. 488 (1966); **2**: 215 (1971).

Darjeeling. Ubayuri-dani, 2200 m (Jul. 25, 1972).

Asplenium unilaterale Lam.: Fl. E. Himal. 489 (1966); **2**: 215 (1971).

Nepal. Shewaden–Papung, ca 2400 m (Jun. 29, 1972).

Darjeeling. Raman–Rimbick, 1900–2400 m (Aug. 5, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Palaeotropics.

var. **udum** Atkins: Clarke in Tr. Linn. Soc. II. Bot. **1**: 481 (1880)–Bedd., Handb. 153 (1883).

Asplenium resectum var. *decurrens* Bedd., Suppl. Ferns 10, t. 357 (1876).

Darjeeling. Phalut–Raman, ca 2100 m (Aug. 4, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. var. Himalaya, Tonkin, Formosa, and S. Japan.

Asplenium varians Wall. ex Hook. et Grev.: Fl. E. Himal. 489 (1966); **2**: 215 (1971).

Nepal. Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

Asplenium Yoshinagae Makino, Phan. Pteriod. Jap. Ic. Ill. **1**: pl. 64 (1900).

A. indicum Sledge: Fl. E. Himal. 487 (1966); **2**: 214 (1971).

A. laciniatum var. *planicaule* Mett.: Banerji, l.c. 276 (1972).

Nepal. Tute, 2300 m (Jun. 6, 1972); Phulchoki, ca 2300 m (Jul. 15, 1972); Sim Chotala-Gram, 900–1900 m (Aug. 20, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

Darjeeling. Observatory Hill, 2200 m (Jul. 24, 1972); Phalut–Raman, ca 2200 m (Aug. 4, 1972).

Distr. Madagascar, Ceylon, S. India, Himalaya and China to continental S.E. Asia, Philippines, Formosa, and S. Japan.

Sledge proposed a new name for *A. planicaule* Wall. ex Mett. non Lowe, admitting the area of this species to Japan (as variety). *Asplenium Yoshinagae* is a valid name and stands as correct for this species unless the Indian plants are distinguished specifically from the Japanese. At present I can not distinguish any variation of taxonomic recognition for the plants belonged to this species even in a varietal rank.

POLYPODIACEAE

Aglaomorpha coronans (Wall. ex Mett.) Copel.: Tagawa in Fl. E. Himal. 489 (1966); **2**: 215 (1971).

Pseudodrynaria coronans (Wall.) Ching: Banerji in Candollea **27**: 279 (1972).

Nepal. Dingla–Doban, 800–1000 m (Jul. 2, 1972).

Arthromeris himalayensis (Hook.) Ching: Fl. E. Himal. 489 (1966); **2**: 215 (1971)–Banerji , l.c. 277 (1972).

Nepal. Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972); Mewa Khola–Papung, ca 2200 m (Jun. 29, 1972).

Darjeeling. Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Distr. E. Himalaya, W. China, and N. Burma.

Arthromeris Lehmannii (Mett.) Ching: Fl. E. Himal. 490 (1966); **2**: 215 (1971).

Arthromeris lungtauensis Ching: Fl. E. Himal. 490 (1966).

NEPAL. Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Mewa Khola–Papung, ca 2200 m (Jun. 29, 1972)*.

DARJEELING. Kalimpong, 1300 m (Jun. 19, 1960–T); Happy Valley, 1900 m (Jun. 26, 1960–T); Victoria Fall, 2100 m (Jul. 24, 1972)*; Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972)*; Phalut–Raman, ca 2400 m (Aug. 4, 1972)*; Raman–Rimbick, 1900–2400 m (Aug. 5, 1972)*; Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Arthromeris lungtauensis is a hairy form of this species and has no peculiarity except for that character. The specimens with an asterisk in the above list are those with hairs in various density and show that the nominal species is not separable from *A. Lehmannii* in specific rank.

Arthromeris tatsienensis (Fr. et Bureau ex Christ) Ching in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 93 (1933).

Polypodium tatsienense Fr. et Bureau ex Christ in Bull. Soc. Fr. 52. Mém. **1**: 19 (1905).

NEPAL. Dhankuta, ca 1200 m (Oct. 19, 1963–T).

Distr. E. Nepal, N. Thailand, and S.W. China.

Arthromeris Wallichiana (Spr.) Ching: Fl. E. Himal. 490 (1966); **2**: 216 (1971)–Banerji, l.c. 277 (1972).

NEPAL. Mure–Sinduwa, 2100 m (Jun. 5, 1972); Mewa Khola–Papung, ca 2200 m (Jun. 29, 1972); Tute–Basantapur, 2300 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); Phalut–Raman, ca 2200 m (Aug. 4, 1972); Raman–Rimbick, 1900–2400 m (Aug. 5, 1972).

Arthromeris Wardii (Clarke) Ching: Fl. E. Himal. **2**: 216 (1971).

NEPAL. Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972).

This specimen is a little different from the typical form of the species in: pinnae broadly lanceolate, the base gradually narrowing towards broadly cuneate base, the margin distinctly undulate, the sori sometimes in two irregular rows. In general habit this is similar to a smaller form of *A. Wallichiana* or in frond form to *A. Lehmannii*, though the soral character is different from these species. We have at hand the same plant collected by Levinge from Observatory Hill at Darjeeling.

Crypsinus ebenipes (Hook.) Copel.: Fl. E. Himal. 491 (1966).

Phymathodes ebenipes (Hook.) Ching: Banerji in Candollea **27**: 278 (1972).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Thudam, 3400 m (Jun. 22, 1972); Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972); Shewaden–Mewa Khola, ca 2300 m (Jun. 29, 1972); Chauke–Tinjure Phedi, 2700 m (Jul. 6, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Tonglu–Sandakphu, 2800–3600 m (Jul. 31, 1972); Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Crypsinus erythrocarpus (Mett. ex Kuhn) Tagawa: Fl. E. Himal. 491 (1966).

NEPAL. Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972).

Distr. E. Himalaya.

Crypsinus Griffithianus (Hook.) Copel.: Fl. E. Himal. 491 (1966); **2**: 216 (1971).

NEPAL. Shewaden–Mewa Khola, ca 2300 m (Jun. 29, 1972).

DARJEELING. Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. Himalaya, S.W. China to S. Japan, and south to W. Malaysia.

Crypsinus malacodon (Hook.) Copel: Fl. E. Himal. 491 (1966); **2**: 216 (1971).

Phymathodes malacodon (Hook.) Ching: Banerji, l.c. 278 (1972).

NEPAL. Dor–Chauke, 2600–2900 m (Jun. 7, 1972); Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972); Thudam–Kipudonsu, ca 4000 m (Jun. 26, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Thale Patil–Mangen, 3100–3400 m (Aug. 27, 1972)

DARJEELING. Sandakphu, 3600 m (Aug. 1, 1972).

In some specimens the sori have a tendency to elongate.

Crypsinus nigrovenius (Christ) K. Iwats., comb. nov.

Polypodium shensiense var. *nigrovenium* Christ in Bull. Acad. Géogr. Bot. **15**: 106 (1906).

Polypodium nigrovenium (Christ) Ching in Bull. Fan Mem. Inst. Biol. **1**: 150 (1930).

Phymathodes nigrovenia (Christ) Ching in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 79 (1933).

NEPAL. Hile Chok–Gopte, 3500 m (Jun. 12, 1972).

Distr. First record for E. Nepal; formerly known in Tonkin and S.W. China (Szechuan & Hupeh).

Crypsinus oxylobus (Wall. ex Kunze) Sledge: Fl. E. Himal. 492 (1966).

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

Distr. Himalaya, N. Thailand, and S.W. China.

Crypsinus quasidivaricatus (Hayata) Ching: Fl. E. Himal. 492 (1966).

NEPAL. Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Shewaden–Mewa Khola, ca 2300 m (Jun. 29, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972).

Crypsinus Stewartii (Bedd.) Copel.: Fl. E. Himal. 492 (1966); **2**: 217 (1971).

NEPAL. Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Dor–Tinjure, 2600–2900 m (Jun. 7, 1972); Shewaden–Mewa Khola, ca 2400 m (Jun. 29, 1972); Dor–Tute, 2300–2600 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

DARJEELING. Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972); Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Ctenopteris subfalcata (Blume) Kunze: Fl. E. Himal. 492 (1966)–Banerji, l.c. 280 (1972).

NEPAL. Tinjure–Tinjure Phedi, 2700–2900 m (Jun. 7, 1972); Mul Pokhari–Lamo Pokhari, 2900 m (Jun. 8, 1972); Lamo Pokhari, 2900 m (Jun. 9, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972); Shewaden–Mewa Khola, ca 2600 m (Jun. 29, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

DARJEELING. Tonglu-Sandakphu, ca 3000 m (Jul. 31, 1972); Palmajua-Batasi, 2100-2200 m (Aug. 8, 1972).

Distr. Ceylon, India, Himalaya, N. Thailand, S. China, and Formosa.

Ctenopteris subminuta in W. Malaysia to Peninsular Thailand seems to be identical with this species.

Drynaria Mollis Bedd.: Fl. E. Himal. **2**: 217 (1971)-Banerji in Candollea **27**: 277 (1972).

NEPAL. Sinduwa-Bhalukhop, 2100-2400 m (Jun. 5, 1972); Mangalbare-Mul Pokhari, 2600-2900 m (Jun. 8, 1972); Dor-Tute, 2300-2600 m (Jul. 7, 1972); Phulchoki, 2200-2700 m (Jul. 15, 1972); Dunche-Singum Gompa, 1900-3200 m (Aug. 22, 1972).

DARJEELING. Phalut-Raman, ca 2200 m (Aug. 4, 1972).

Drynaria propinqua (Wall. ex Mett.) J. Smith ex Bedd.: Fl. E. Himal. 493 (1966); **2**: 217 (1971).

NEPAL. Sanguri Bhanjyang, ca 1250 m (Jun. 2, 1972); Papung-Bir Gaon, 1600-2000 m (Jun. 30, 1972); Bir Gaon-Saju Khola, 1400-1600 m (Jul. 1, 1972).

DARJEELING. Raman-Rimbick, 1900-2400 m (Aug. 4, 1972).

Distr. Himalaya, Burma, N. Thailand, Indo-China, and S. China.

Drynaria quercifolia (L.) J. Smith: Fl. E. Himal. 493 (1966).

NEPAL. South of Dharan, 200 m (Jun. 1, 1972).

DARJEELING. Tista, ca 400 m (Aug. 10, 1972).

Lemmaphyllum rostratum (Bedd.) Tagawa: Fl. E. Himal. 493 (1966); **2**: 217 (1971).

DARJEELING. Batasi-Mani Bhanjyang, 2000-2100 m (Aug. 9, 1972).

Lepisorus bicolor (Takeda) Ching: Fl. E. Himal. **2**: 217 (1971).

NEPAL. Thudam, 3400 m (Jun. 22, 1972); Chauke-Dor, 2600-2900 m (Jul. 6, 1972); Phulchoki, 2200 m (Jul. 15, 1972).

DARJEELING. Mani Bhanjyang-Tonglu, 2000-3000 m (Jul. 30, 1972).

Lepisorus contortus (Christ) Ching: Fl. E. Himal. 493 (1966).

NEPAL. Bilbatay Bhanjyang, ca 2200 m (Oct. 25, 1963); Taplejung, ca 1700 m (Nov. 2, 1963); Taplejung-Garhi Danra, 2000-2200 m (Nov. 3, 1963); Tuwa-Taplethok, 1400-1800 m (Nov. 5, 1963); Yamphodin-Ghatte, 1600-2100 m (Nov. 18, 1963); Ghatte-Khebang, 1600-2400 m (Nov. 19, 1963); Birwa-Yektin, 1400-2800 m (Nov. 28, 1963); Gokarna, Kathmandu, 1400 m (Jun. 22, 1967); Godawari-Phulchoki, 2100-3000 m (May 29, 1969); Chitre-Basantapur, 2300-2400 m (Jun. 6, 1972); Dor-Chauke, 2600-2900 m (Jun. 7, 1972); Mewa Khola-Papung, ca 2200 m (Jun. 29, 1972).

DARJEELING. Batasi-Mani Bhanjyang, 2000-2100 m (Aug. 9, 1972).

SIKKIM. Gangtok-Saramsa Medicinal Garden, 800 m (Jun. 17, 1960).

BHUTAN. Phuntsholing-Chimakhothi, 900-2350 m (Apr. 4, 1967).

Lepisorus loriformis (Wall. ex Mett.) Ching: Fl. E. Himal. 494 (1966); **2**: 217 (1971).

NEPAL. Phulchoki, 2200-2700 m (May 28 & Jul. 15, 1972); Tute, 2300 m (Jun. 6, 1972); Tinjure-Tinjure Phedi, 2700-2900 m (Jun. 7, 1972); Topke Gola-Shewaden, ca 2700 m & ca 3000 m (Jun. 28, 1972); Bir Gaon-Saju Khola, 1400-1600 m (Jul. 1, 1972); Chauke, 2700 m (Jul. 5, 1972).

DARJEELING. Tonglu-Sandakphu, ca 2800 m (Jul. 31, 1972); Phalut-Raman, ca 2300 m (Aug. 4, 1972).

Lepisorus nepalensis K. Iwats., sp. nov. [Fig. 23]

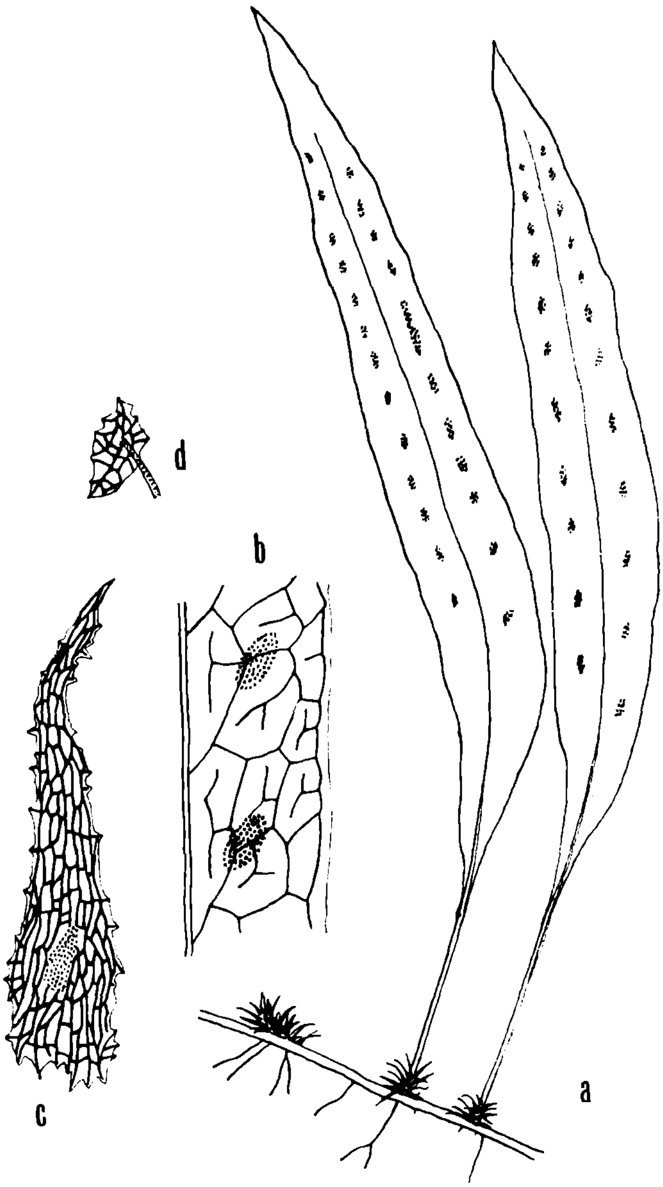

Fig. 23. *Lepisorus nepalensis* K. Iwats., sp. nov. Kanai et al. 725227. a. Plant, ×1, b. Venation, ×1.5, c. Rhizome scale, ×30, d. Paraphysis, ×30.

Rhizomate tenui, longe repente, 1.0–1.5 mm crasso, paleis rhizomatis clathratis, concoloribus, margine dentatis, frondibus lanceolatis, infra medium latissimis, pallide viridibus, in sicco fuscis, tenuibus, 6–12(–22) cm longis, 0.8–1.2(–2.5) cm latis, soris medialibus vel subcostularibus, rotundatis.

Rhizome long creeping, 1.0–1.5 mm in diameter, dark brown, densely covered with the scales, bearing fronds usually more than 1 cm apart from the next ones; rhizome scales oblong subtriangular, peltately attached, round at base, gradually narrowing towards acute apex, 2–6 mm long, to 0.8 mm broad at the broadest portion, concolorously fusco-brown, clathrate, with subquadrangular cells, toothed at margin with distinct septa of marginal cells. Stipes 2–3(–6) cm long, stramineous, scaly at base, very sparsely minute scaly upwards; laminae simple, nearly entire, lanceolate, gradually narrowing towards attenuate base, broadest at middle to lower one-third portion, narrowing upwards to acuminate apex, with narrow cartilaginous membrane at edge, 6–12(–22) cm long, 0.8–1.2(–2.5) cm broad; midribs distinct throughout, inconspicuously raised on both surfaces, green but blackish in dried specimens; lateral veins hardly visible, veins reticulate, areoles usually three in rows at each side of midribs, with variously branched included veinlets; the surfaces with scales similar to rhizome scales but smaller and usually more irregular in form with distinct teeth at margin; texture papyraceous and green to pale green in living condition, but herbaceous and dark brown to blackish in dried specimens. Sori compital, round to oblong, medial to a little nearer to midribs, in a single row at each side of midribs, superficial, usually 1–2 mm in diameter, covered with the scales similar to those on laminae and umbrella-shaped paraphyses.

NEPAL. Kyangjing, Langtang Khola, 3600–3900 m (Jul. 14, 1970); Hile Chok–Ghopte, 3500 m, on moist cliff along path in shade (Jun. 12, 1972, no. 725186); Topke Gola, 3600 m, on stone-wall in light shade in village (Jun. 18, 1972, no. 725220); Topke Gola–Jalang Chhyongo, ca 3800 m, on moist cliff in shade (Kanai, Ohashi, K. Iwatsuki, Ohba, Z. Iwatsuki & Shakya, Jun. 20, 1972, no 725227. Holotype in TI); Thudam, 3400 m, on moist rock in forest along river (Jun. 22, 1972, no. 725235); Thudam–Lama Chungbu, 3400–4200 m, on mossy rock in dense forest along river (Jun. 23, 1972, no. 725248); Thudam–Kipudonsu, ca 4000 m, on moist cliff along path (Jun. 26, 1972, no. 725270).

This is a distinct species with deciduous fronds and confined to the area 3400–4000 m alt. in E. Himalaya. No close relative can safely be given to the present new species, though this belongs to the group of *L. Scolopendrium* in broader sense. I have never seen the type of *L. kuchenensis* from Yao Shan, but this seems to have several characters common to our species, as far as the descriptions and notes given to *L. kuchenensis* are concerned.

Lepisorus nudus (Hook.) Ching: Fl. E. Himal. 494 (1966); **2**: 217 (1971)–Banerji in Candollea **27**: 278 (1972).

NEPAL. Sinduwa, ca 1100 m (Oct. 24, 1963); Bilbatay Bhanjyang, ca 2200 m (Oct. 25, 1963); Taplejung, ca 1700 m (Nov. 2, 1963); Khebang–below Siling Tzokupa, 1700–2100 m (Nov. 20 & 22, 1963); Tharpu–near Chyangthaphu, 1100–1200 m (Nov. 26, 1963); near Chyangthaphu–Birwa, 1200–2400 m (Nov. 27, 1963); Godawari–Phulchoki, 1600–2500 m (Jun. 26, 1967); Thale–Sim Chotala, 720–2200 m (Jun. 6, 1969); Kuwa Pani–Hile, 1900 m (Jun. 4, 1972)*; Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972)*; Chitre–Hile, 1900–2400 m (Jul. 8, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972).

DARJEELING. Observatory Hill, 2200 m (Jul. 24, 1972)*.

Distr. Himalaya, N. Thailand, and China.

The specimens with an asterisk are different from the typical form in rhizome scales not so distinctly clathrate consisting in smaller cells with thinner internal walls, more or less bicoloured with brown central portion and the paler margin.

Lepisorus Scolopendrium (Ham. ex Don) Tagawa: Fl. E. Himal. 494 (1966); **2**: 218 (1971).

NEPAL. Dhankuta–Nigale, 1300–1600 m (Jun. 4, 1972); Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

DARJEELING. Observatory Hill, 2200 m (Jul. 24, 1972); Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972); Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972); Palmajua–Batasi, 2100–2200 m (Aug. 8, 1972); Lopchu–Tista, ca 600 m (Aug. 10, 1972).

Distr. Himalaya, Tibet, N. Thailand, and Yunnan.

Lepisorus subconfluens Ching in Bull. Fan Mem. Inst. Biol. **4**: 85 (1933).

BHUTAN. Rukubi–Neylong, 2400–2800 m (Apr. 14, 1967); Yabu Thang–Laya, 3400–3850 m (May 16, 1967).

Distr. Bhutan, N. Thailand, and S.W. China (Yunnan).

Lepisorus sublinearis (Baker ex Takeda) Ching: Fl. E. Himal. 494 (1966); **2**: 218 (1971).

NEPAL. Sanguri Bhanjyang, ca 1250 m (Jun. 2, 1972); Hile–Chitre, 1900–2400 m (Jun. 5, 1972).

DARJEELING. Lopchu, ca 800 m (Aug. 10, 1972).

Distr. Himalaya, Burma, Thailand, Indo-China, and Yunnan.

Lepisorus suboligolepidus Ching in Bull. Fan Mem. Inst. Biol. **4**: 77 (1933).

BHUTAN. Chamsa–Yabu Thang, 3200–3700 m (May 15, 1967).

Distr. Bhutan, N. Thailand, S.W. China (Yunnan), and Formosa.

Loxogramme chinensis Ching: Fl. E. Himal. **2**: 218 (1971).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972); Palmajua–Batasi, 2100–2200 m (Aug. 8, 1972).

Distr. Himalaya, Upper Burma, N. Thailand, Tonkin, and S. & S.W. China.

Loxogramme Duclouxii Christ: Fl. E. Himal. **2**: 218 (1971).

NEPAL. Mure–Sinduwa, 2100 m (Jun. 5, 1972); Chitre–Dor, 2300–2600 m (Jun. 6, 1972).

DARJEELING. Ubayuri-dani, 2200 m (Jul. 25, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972); Thame–Lopchu, ca 900 m (Aug. 10, 1972).

Distr. Himalaya, N. Thailand, Yunnan, and Japan.

Loxogramme involuta (Don) Presl: Fl. E. Himal. 495 (1966); **2**: 218 (1971)–Banerji in Candollea **27**: 277 (1972).

NEPAL. Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

DARJEELING. Lopchu–Tista, ca 600 m (Aug. 10, 1972).

There are two forms of this species; one with narrower scales and the costa raised on upper surface, and the other with broader scales and the costa hardly raised on the upper surface of leaves.

Microsorium cuspidatum (Don) Tagawa: Fl. E. Himal. 495 (1966); **2**: 218 (1971).

NEPAL. Sanguri Bhanjyang–Dhara Pani, ca 1250 m (Jun. 2 & Jul. 10, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 10, 1972).

DARJEELING. Lopchu–Tista, ca 600 m (Aug. 10, 1972).

Microsorium membranaceum (Don) Ching: Fl. E. Himal. 495 (1966)–Banerji, l.c. 278 (1972).

NEPAL. Sanguri Bhanjyang, 1250 m (Jun. 2, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

DARJEELING. Lloyd Botanic Garden, 2100 m (Jul. 26, 1972); Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Microsorium hymenodes (Kunze) Ching: Fl. E. Himal. **2**: 218 (1971).

NEPAL. Phulchoki, ca 1500 m (Jul. 15, 1972).

Neocheiropteris normalis (Don) Tagawa: Fl. E. Himal. 496 (1966); **2**: 218 (1971).

DARJEELING. Palmajua, 2200 m (Aug. 7, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Distr. Himalaya, Burma, Thailand, Malaya, Sumatra, Indo-China, and Yunnan.

Polypodium amoenum Wall. ex Mett.: Fl. E. Himal. 496 (1966); **2**: 219 (1971), cum f. *pilosum*.

NEPAL. Phulchoki, 2200–2700 m (May 28, 1972); Sanguri Bhanjyang–Dhara Pani, ca 1250 m (Jun. 2, 1972); Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Shewaden–Mewa Khola, ca 2300 m (Jun. 29, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972).

DARJEELING. East Birch Hill Road, 2100 m (Jul. 22, 1972); East Side, 2100 m (Jul. 23, 1972); Mani Bhanjyang–Tonglu, 2000–3000 m (Jul. 30, 1972); Phalut–Raman, ca 2300 m (Aug. 4, 1972).

Distr. Himalaya, Burma, N. Thailand, Indo-China, China, and Formosa.

Polypodium argutum Wall. ex Hook: Fl. E. Himal. 497 (1966); **2**: 219 (1971)–Banerji in Candollea **27**: 279 (1972).

NEPAL. Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Mul Pokhari–Lamo Pokhari, 2900 m (Jun. 8, 1972); Chauke–Tinjure Phedi, 2700 m (Jul. 6, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

DARJEELING. Tonglu–Sandakphu, ca 2800 m (Jul. 31, 1972); Phalut–Raman, ca 2200 m (Aug. 4, 1972).

Distr. Himalaya, Thailand, Indo-China, China, Formosa, and Philippines.

Polypodium Atkinsoni C. Chr., Ind. Fil. 511 (1906)–Ching in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 48 (1933)–Alston & Bonner in Candollea **15**: 205 (1956)–Banerji, l.c. 279 (1972).

Polypodium Hendersoni Atkins. apud Baker in Hook., Syn. Fil. 511 (1874), non Lowe (1858).

Goniophlebium Hendersoni Bedd., Ferns Brit. Ind. Suppl. 21, pl. 384 (1876); Handb. 320 (1883).

NEPAL. Topke Gola, 3600 m (Jun. 18, 1972); Thudam, 3400 m (Jun. 22, 1972); Topke Gola–Shewaden, ca 2800 m (Jun. 28, 1972); Gopte–Thale Patil, 3200–3500 m (Aug. 26, 1972).

DARJEELING. Sandakphu–Phalut, 3200–3600 m (Aug. 2, 1972).

Distr. E. Himalaya and Tibet.

Polypodium lachnopus Wall. ex Hook.: Fl. E. Himal. 497 (1966); **2**: 219 (1971).

Nepal. Kuwa Pani–Hile, 1900 m (Jun. 4, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Dunche–Singum Gompa, 1900–3200 m (Aug. 22, 1972).

Darjeeling. East Side, 2100 m (Jul. 23, 1972).

Distr. Himalaya and S.W. China.

Polypodium microrhizoma Clarke ex Baker: Fl. E. Himal. 497 (1966).

Nepal. Chitre–Basantapur, 2300–2400 m (Jun. 6, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Basantapur–Chitre, 2300–2400 m (Jul. 7, 1972); Phulchoki, 2200–2700 m (Jul. 15, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972).

Darjeeling. East Birch Hill Road, 2100 m (Jul. 22, 1972); Ubayuri-dani, 2200 m (Jul. 25, 1972); Palmajua, 2200 m (Aug. 7, 1972).

Distr. Himalaya, Upper Burma, N. Thailand, S.W. China, and Formosa.

Polypodium subamoenum Clarke: Fl. E. Himal. 497 (1966).

Nepal. Kokim Pokhari–Hati Surde, 3000–3600 m (Jun. 11, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972).

Pyrrosia adnascens (Sw.) Ching: Fl. E. Himal. 497 (1966)–Banerji in Candollea **27**: 279 (1972).

Nepal. South of Dharan, 200 m (Jun. 1, 1972); Saju Khola–Dingla, 1000–1400 m (Jul. 1, 1972).

Distr. Palaeotropics.

Pyrrosia costata (Presl ex Bedd.) Tagawa et K. Iwats.: Fl. E. Himal. **2**: 219 (1971).

Nepal. Dharan–Dhara Pani, 400–1300 m (Jun. 2, 1972); Mohamabedi Khola–Tamur Bridge, 300–400 m (Jun. 3, 1972); Bir Gaon–Saju Khola, 1400–1600 m (Jul. 1, 1972).

Darjeeling. Lopchu, ca 800 m (Aug. 10, 1972).

Distr. Himalaya, Upper Burma. N. Thailand, and Yunnan.

Pyrrosia flocculosa (Don) Ching: Fl. E. Himal. 498 (1966); **2**: 219 (1971)–Banerji, l.c. 280 (1972).

Nepal. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972).

Pyrrosia Heteractis (Mett. ex Kuhn) Ching: Fl. E. Himal. 498 (1966); **2**: 219 (1971).

Darjeeling. Tista, ca 400 m (Aug. 10, 1972).

Pyrrosia Mannii (Gies.) Ching: Fl. E. Himal. 498 (1966); **2**: 219 (1971)–Banerji, l.c. 280 (1972).

Nepal. Kathmandu, ca 1300 m (May 28, 1972); Dhara Pani, ca 1000 m (Jun. 3, 1972); Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Dingla–Doban, 800–1000 m (Jul. 2, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Darjeeling. Ubayuri-dani, 2200 m (Jul. 25, 1972); Palmajua, 2200 m (Aug. 7, 1972); Batasi–Mani Bhanjyang, 2000–2100 m (Aug. 9, 1972).

Pyrrosia nuda (Gies.) Ching: Fl. E. Himal. 499 (1966).

Nepal. Dingla–Doban, 800–1000 m (Jul. 2, 1972).

Darjeeling. Tista, ca 400 m (Aug. 10, 1972).

Distr. Himalaya, N. Thailand, and China.

Xiphopteris sikkimensis (Hieron.) Copel.: Fl. E. Himal. 499 (1966); **2**: 220 (1971).

NEPAL. Lamo Pokhari, 2900 m (Jun. 9, 1972); Topke Gola–Shewaden, ca 3200 m (Jun. 28, 1972).

VITTARIACEAE

Vittaria flexuosa Fée: H. Ito in Fl. E. Himal. 499 (1966); **2**: 220 (1971)–Banerji in Candollea **27**: 269 (1972).

V. himalayensis Ching : Fl. E. Himal. 500 (1966); **2**: 220 (1971), p.p.

NEPAL. Papung–Bir Gaon, 1600–2000 m (Jun. 30, 1972); Gram–Dunche, 1900–2000 m (Aug. 21, 1972).

DARJEELING. Observatory Hill, 2200 m (Jul. 24. 1972).

Distr. E. Himalaya, Burma, Thailand, Indo-China, S.W. China, Formosa, Japan, Korea, and south to Malaysia throughout to New Guinea.

Vittaria sikkimensis Kuhn in Linnaea **36**: 66 (1869)–Bedd., Handb. 406, f. 239 (1883)–Ching in Sinensia **1**: 180 (1931).

V. modesta Hand.-Mzt. sensu H. Ito in Fl. E. Himal. 500 (1966).

SIKKIM. Yoksam, 1700 m (May 17, 1960).

Distr. Sikkim, N. Thailand, and Yunnan.

Vittaria taeniophylla Copel.: Fl. E. Himal. 500 (1966).

V. himalayensis Ching: Fl. E. Himal. **2**: 220 (1971), p.p.–Banerji, l.c. 269 (1972).

V. mediosora Hayata: Fl. E. Himal. 500 (1966); **2**: 220 (1971).

NEPAL. Bhuspate Danra, ca 2600 m (Dec. 2, 1963); Sinduwa–Bhalukhop, 2100–2400 m (Jun. 5, 1972); Tute, 2300 m (Jun. 6, 1972); Dor–Chauke, 2600–2900 m (Jun. 7, 1972); Mangalbare–Mul Pokhari, 2600–2900 m (Jun. 8, 1972); Lamo Pokhari, 2900 m (Jun. 9, 1972); Kokim Pokhari–Hati Surde, 3000–3600 m (Jun. 11, 1972); Thudam, 3400 m (Jun. 25, 1972); Topke Gola–Shewaden, ca 3000 m (Jun. 28, 1972); Chauke-Tinjure Phedi, 2700 m (Jul. 7, 1972); Phulchoki, 2300 m (Jul. 15, 1972); Mangen-Khodang Danda, 2500–3100 m (Aug. 28, 1972); Khodang Danda–Latsu, 2100–2500 m (Aug. 29, 1972); Bhorlang–Sundarijar, 1400–2400 m (Aug. 31, 1972).

DARJEELING. Observatory Hill, 2200 m (Jul. 24, 1972); Tonglu–Sandakphu, ca 3000 m (Jul. 31, 1972); Rimbick–Palmajua, 1500–2200 m (Aug. 6, 1972).

Distr. E. Himalaya, Burma, N. Thailand, Yunnan, Formosa, and the Philippines.

Hayata described two species of this group in Formosa. The type of *V. mediosora* represents a plant bearing extremely narrow leaves of up to 3.5 mm in breadth. Contrary to this, the type of *V. arisanensis* is larger, to 60 cm long and 1.2 cm broad. In E. Himalaya this is a common species and varies to some extent in the size of leaves. We observed the variation of leaves as 2.8–12.0 mm in breadth in fully fertile leaves and to 70 cm in length. As in the case of *V. elongata*, *V. taeniophylla* is quite variable in size and we can not distinguish *V. arisanensis* and *V. mediosora* as distinct species. I have never examined the type of *V. himalayensis*, but am suggesting here that this also belongs to *V. taeniophylla.*

SALVINIACEAE

Azolla imbricata (Roxb.) Nakai: H. Ito in Fl. E. Himal. 500 (1966).
NEPAL. Bir Gaon-Saju Khola, 1400-1600 m (Jul. 1, 1972).

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Additions of ferns to the 2nd report of "Flora of Eastern Himalaya" (by Hirosi Ito).

ASPIDIACEAE

Dryopteris chrysocoma (Christ) C. Chr.: H. Ito in Fl. E. Himal. 476 (1966).
BHUTAN. Dotanang-Thimphu, 2700-2450 m (May 28, 1967).
Dryopteris Harae H. Ito in Fl. E. Himal. 476, pl. 26 (1966).
BHUTAN. Chimakhothi-Phuntsholing, 2350-300 m (Jun. 2, 1967).
Dryopteris lepidopoda Hayata: Fl. E. Himal. 477 (1966).
BHUTAN. Rukubi-Neylong, 2800-2400 m (Apr. 14, 1967).

ASPLENIACEAE

Asplenium Rockii C. Chr. in Contr. U.S. Nat. Herb. **26**: 332 (1931).
BHUTAN. Bhotokha-Rinchu, 1450-1500 m (May 8, 1967).
Distr. Himalaya (a new record) and Thailand.

BRYOPHYTA

ANTHOCEROTAE (by Sinske Hattori)

ANTHOCEROTACEAE (by Sinske Hattori)

Anthoceros erectus Kashyap in New Phytol. **14**: 9 (1915); in Journ. Bombay Nat. Hist. Soc. **25**: 281 (1916/8); Liverw. W. Himal. Panjab Pl. **1**: 25, pl. 1, 1-4 (1929).

A. Butleri Steph., Sp. Hepat. **5**: 986 (1916).

NEPAL. Shewaden–Papung, 2150 m, on soil (Jun. 29, 1972); Bir Gaon–Dingla, 1610 m (Jul. 1, 1972).

Distr. Himalaya, India, and ?Ceylon.

Anthoceros glandulosus Lehm. et Lindenb. in Lehm., Pugillus **4**: 26 (1832)–Meijer in Journ. Hattori Bot. Lab. **18**: 3, pl. 2, 1 (1957).

NEPAL. Bir Gaon–Dingla, 1150 m, on soil (Jul. 1, 1972); Dingla–Doban, 800 m, on soli (Jul. 2, 1972).

Distr. Widely distributed in tropic Asia, southward to Australia and eastward to Samoa.

Phaeoceros himalayensis (Kashyap) Proskauer in Bapna et Vyas in Journ. Hattori Bot. Lab. **25**: 88 (1962).

Anthoceros himalayensis Kashyap in New Phytol. **14**: 8 (1915); Liverw. W. Himal. Panjab Pl. **1**: 26, pl. 1, 58 (1929).

NEPAL. Kuwa Pani–Hile, 1900 m, on rock (Jun. 4, 1972); Hile–Chitre, 1980 m, on soil (Jun. 5, 1972); Nessum–Bhuje, 1750 m, on rock (Jul. 3, 1972).

Distr. Himalaya and India.

HEPATICAE (organized by Sinske Hattori)[1]

TAKAKIACEAE (by Sinske Hattori)

Takakia ceratophylla (Mitt.) Grolle in Österr. Bot. Zeitschr. **110**: 444, f. 1 (1963)–Hatt. et al. in Journ. Jap. Bot. **48**: 2, f. 1–3 (1973).

NEPAL. Ghopte–Gosa, 4020–4050 m, on rock (Jun. 13, 1972); Gosa–Banduke Pokhari, 4050–4210 m, on rock and in crevices of rocks (Jun. 14, 1972); around Banduke Pokhari, 4120 m, on rock (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4150–4170 m, on rock, rocky cliff, and in crevices of rocks (Jun. 15, 1972); Saju Pokhari–pass to Topke

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[1] The following authorities are in charge of the study and preparation of manuscripts for the families and genus in the parentheses: Dr. M. Mizutani (Lepidoziaceae and Lejeuneaceae), Dr. N. Kitagawa (Lophoziaceae, Cephaloziellaceae, Lophocoleaceae, Gymnomitriaceae), Dr. T. Amakawa (Jungermanniaceae and Scapaniaceae), Dr. H. Inoue (Plagiochilaceae), Mr. K. Yamada (Radulaceae), and Dr. R. Grolle (*Asterella*).

Gola, 4100–4350 m, on rocks, rocky cliff, and in crevices of rocks (Jun. 16, 1972); slope above Jalang Chhyongo, 4350 m, on soil (Jun. 21, 1972); around Kipuphu, 4520–4550 m, on rock and in crevices of cliff (Jun. 26, 1972); Topke Gola–Shewaden, 3050 m, on rock (Jun. 28, 1972).

Distr. Himalaya (Nepal and Sikkim) and Aleutians (Amchitka Isl.). New to Nepal.

Takakia lepidozioides Hatt. et Inoue in Journ. Hattori Bot. Lab. **19**: 133, f. 1–24 (1958)–Hatt. et al. in Journ. Jap. Bot. **48**: 7, f. 2, i–l (1973).

NEPAL. Banduke Pokhari–Saju Pokhari, 4170 m, on rock (Jun. 15, 1972).

Distr. Himalaya (Nepal), N. Borneo, Japan, and along the Pacific coast of Alaska and Canada. New to Himalaya.

HERBERTACEAE (by Sinske Hattori)

Herberta dicrana (Tayl.) Trev.: Fl. E. Himal. 503 (1966).

NEPAL. Hile–Chitre, 2150 m, on rock (Jun. 5, 1972); Basantapur–Dor, 2370–2510 m, on rock, fallen tree, and tree trunk (Jun. 6, 1972); Dor–Chauke, 2850 m, on rock, decaying tree, and tree trunks (Jun. 7, 1972); mossy forest below Lamo Pokhari, 2630–2700 m, fallen and decaying branches (Jun. 9, 1972); Suke–Hile Chok, 3200–3550 m, on tree trunks (Jun. 11, 1972); Ghopte–Gosa (near Kobche), 3650 m, on rock (Jun. 13, 1972); coniferous forest above Topke Gola, 3650 m, on fallen tree (Jun. 18, 1972); forest below Thudam, 3250 m, on tree trunk and fallen branches (Jun. 25, 1972); Shewaden–Papung, 2200 m, on rock (Jun. 29, 1972); Gupha Pokhari–Chauke, 2600 m, on decaying branches (Jul. 4, 1972); Dor–Chitre, 2500 m, on branches (Jul. 7, 1972); Phulchoki, summit area, 2650 m, on tree trunk (Jul. 15, 1972).

Distr. E. Nepal, Sikkim, Darjeeling, Bhutan, Khasia Hills, Nilghiri Hills, and China.

This species is common and very variable in the Himalayas. *Herberta chinensis* Steph. seems to be closely related to the present species. A specimen collected between Suke and Hile Chok, for instance, seems to be an intermediate form between *H. chinensis* and the present species.

Herberta fragilis (Steph.) Herz.: Fl. E. Himal. 503 (1966); **2**: 222, f. 19 (1971)–Grolle in Ergebn. Forsch.-Unt. Nepal Himal. **1**: 290 (1966).

NEPAL. Hile–Chitre, 2350 m, on rock (Jun. 5, 1972); Basantapur–Dor, 2510 m, on rocky cliff (Jun. 6, 1972); Chauke–Lamo Pokhari, 2750–2850 m, on rock (Jun. 8, 1972); mossy forest below Lamo Pokhari, 2680 m, on rock (Jun. 9, 1972); Suke, 2900 m, on rock (Jun. 10, 1972); forest below Thudam, 3250 m, on rock (Jun. 25, 1972); Topke Gola–Shewaden, 3300 m, on tree trunk (Jun. 28, 1972); Shewaden–Papung, 2500 m, on rock (Jun. 29, 1972); Dor–Chitre, 2500 m, on branch (Jul. 7, 1972); forest near Chitre, 2350 m, on rock (Jul. 7, 1972).

Distr. Nepal, Sikkim, and China (N.W. Yunnan).

This species seems to be closely related to *H. adunca* (Dicks.) Gray.

Herberta Giraldiana (Steph.) Nichols.: Fl. E. Himal. **2**: 223 (1971).

H. Giraldiana var. *verruculosa* Hatt., l.c. 223, f. 20 (1971), syn. nov.

NEPAL. Ghopte–Gosa, 2750 m, on soil and rock (Jun. 13, 1972); around Banduke Pokhari, 4120 m, on rock (Jun. 14, 1972); coniferous forest above Topke Gola, 3650 m, on tree trunk and rock (Jun. 18, 1972); Topke Gola, coniferous forest by pond, 3600 m, on rotten log (Jun. 19, 1972); forest below Thudam, 3250 m, on tree trunk (Jun. 25, 1972).

Distr. Nepal, Bhutan, and China (Shen-si, Szechuan, and Yunnan).

Herberta himalayana (Steph.) Herz.: Fl. E. Himal. 503 (1966); **2**: 224 (1971).

NEPAL. Basantapur–Dor, 2550 m, on branch (Jun. 6, 1972); Suke–Hile Chok, 3500 m, on humus (Jun. 11, 1972); Saju Pokhari–pass to Topke Gola, 4150 m, on rock (Jun. 16, 1972); Lama Chungbu–Slesa, 4250 m, on rock (Jun. 24, 1972).

Distr. Nepal, Sikkim, Darjeeling, and Bhutan.

A specimen collected between Lama Chungbu and Slesa has pilose leaf- and underleaf-lobes, the pili composed of a row of 7–13 (mostly 8–10) cells.

Herberta Kurzii (Steph.) Chopra: Fl. E. Himal. 503 (1966); **2**: 225 (1971).

NEPAL. Banduke Pokhari–Saju Pokhari, 4150–4170 m, on soil and rock (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4150 m, on rock (Jun. 16, 1972); coniferous forest above Topke Gola, 3600–3650 m, on tree trunks (Jun. 18, 1972); Phujeng La–Topke Gola, 4500 m, on rock (Jun. 27, 1972).

Herberta pseudoceylanica Hatt. in Fl. E. Himal. **2**: 225, f. 21 (1971).

NEPAL. Hile Chok–Ghopte, 3350 m, on fallen branches (Jun. 12, 1972); Topke Gola, 3600 m, fire wood (Jun. 17, 1972); coniferous forest above Topke Gola, 3500 m, on tree trunk (Jun. 18, 1972); forest below Thudam, 3250 m, on branch (Jun. 25, 1972).

Distr. Nepal, Sikkim, and Bhutan. New to Nepal.

Herberta Sendtneri (Nees) Evans: Fl. E. Himal. 504 (1966); **2**: 226 (1971).

NEPAL. Saju Pokhari–pass to Topke Gola, 4100–4300 m, on humus (Jun. 16, 1972); *Rhododendron* forest above Topke Gola, 3650 m (Jun. 18, 1972); Lama Chungbu–Slesa, 4250 m, on rock (Jun. 24, 1972); around Kipuphu, 4450–4500 m, on rock (Jun. 24, 1972).

BLEPHAROSTOMATACEAE (by Sinske Hattori)

Blepharostoma trichophyllum (L.) Dum.: Fl. E. Himal. 504 (1966); **2**: 226 (1971).

NEPAL. Forest below Lamo Pokhari, 2730 m, on rotten tree trunk (Jun. 9, 1972); Suke–Hile Chok, 3570 m, on humus (Jun. 11, 1972); Hile Chok–Ghopte, 3400, on rock (Jun. 12, 1972); Ghopte–Gosa, 3700–4100 m, on rocks and rotten log (Jun. 13, 1972); Gosa–Banduke Pokhari, 4050 m, on soil (Jun. 14, 1972); around Banduke Pokhari, 4120 m, in crevices of rocks (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola, 4350 m, on rock and cliff (Jun. 16, 1972); coniferous forest above Topke Gola, 3600–3610 m, on tree trunks and rotten log (Jun. 18, 1972); *Rhododendron* forest above Topke Gola, 3650 m (Jun. 18, 1972); Jalang Chhyongo–Janga La, 4600 m (Jun. 21, 1972); Janga La–Thudam, 4550 m, on soil-covered rock (Jun. 21, 1972); Lama Chungbu–Slesa, 4350 m, on soil (Jun. 24, 1972); forest below Thudam, 3250 m, on soil (Jun. 25, 1972); around Kipuphu, 4550 m, in crevices of rocks (Jun. 26, 1972); Topke Gola–Shewaden, 3250–3350 m, on rotten log (Jun. 28, 1972); Shewaden–Papung, 2000 m, on rotten log (Jun. 29, 1972).

Distr. E. Africa, Europe, Himalaya, New Guinea, China, Formosa, Japan, Korea, Siberia, Hawaii, and N. and C. America.

Pseudolepicolea Trollii (Herz.) Grolle et Ando: Fl. E. Himal. 504 (1966)- Hatt. et Mizt. in Journ. Hattori Bot. Lab. **31**: 252, f. 1–2 (1968).

P. Trollii var. *darjeelingensis* Hatt. et Mizt., l.c. 252, f. 1–3 (1968), syn. nov.

Nepal. Dor–Chauke, 2750 m, on rocky cliff (Jun. 7, 1972); Hile Chok–Ghopte, 3350–3500 m, on rock and cliff (Jun. 12, 1972); Ghopte–Gosa, 3650–4020 m, on rock and cliff (Jun. 13, 1972); forest below Thudam, 3350 m, on rock (Jun. 25, 1972).

TRICHOCOLEACEAE (by Sinske Hattori)

Trichocolea tomentella (Ehrh.) Dum.: Fl. E. Himal. 504 (1966).

Nepal. Chauke–Lamo Pokhari, 2850 m, on rock (Jun. 8, 1972); Suke–Hile Chok, 3570 m, on humus (Jun. 11, 1972); Topke Gola–Shewaden, 2850–3150 m, on soil and bank (Jun. 28, 1972); Shewaden–Papung, 2000-2600 m, on rock (Jun. 29, 1972).

Distr. Europe, Himalaya, Khasia, Assam, N. Vietnam, China, Formosa, Japan, Korea, ?Java, ?Sumatra, and ?New Hebrides.

PTILIDIACEAE (by Sinske Hattori)

Mastigophora Woodsii (Hook.) Nees: Fl. E. Himal. 504 (1966).

Nepal. Topke Gola–Shewaden, 3250 m, on tree trunk (Jun. 28, 1972).

Distr. Scotland, Ireland, Faeroes, Himalaya, Bengal, W. China (Yunnan), and Canada (British Columbia).

Ptilidium ciliare (L.) Hampe, Prodr. Fl. Hercyn. 76 (1836).

Nepal. Topke Gola, ca. 3600 m, fire woods (Jun. 17, 1972).

Distr. Circumboreal, barely into the northernmost limit of the deciduous forest as a relict; also rarely (and locally) in Argentina (Tierra del Fuego) and New Zealand.

LEPIDOZIACEAE (by Masami Mizutani)

Bazzania angustistipula N. Kitag. in Journ. Hattori Bot. Lab. **30**: 268 (1967).

Nepal. Basantapur–Dor, 2550 m, on branches (Jun. 6, 1972); Dor, 2300 m, on branches (Jun. 6, 1972); Dor–Chauke, 2850 m, on branches (Jun. 7, 1972); below Lamo Pokhari, 2630 m, on tree-trunks (Jun. 9, 1972); Suke–Hile Chok, 3500 m, on tree-trunks (Jun. 11, 1972).

Distr. Nepal and Thailand. New to Himalaya.

Bazzania himalayana (Mitt.) Schiffn.: Fl. E. Himal. 505 (1966).

Nepal. Chitre–Basantapur, 2350 m, on tree-trunks (Jun. 6, 1972).

Distr. Nepal, Sikkim, Bhutan, Assam, and Philippines. New to Nepal.

Bazzania imbricata (Mitt.) Hatt.: Fl. E. Himal. 505 (1966).

Nepal. Suke, 2900 m, on humus (Jun. 10, 1972); Suke–Hile Chok, 3200 m, on tree-trunk (Jun. 11, 1972); Ghopte–Gosa, 3850 m, on humus (Jun. 13, 1972); Gosa–Banduke Pokhari, 4050 m, on rocks (Jun. 14, 1972); below Thudam, 3250 m, on branches (Jun. 25, 1972); Topke Gola–Shewaden, 3250 m, on rotten logs (Jun. 28, 1972).

Distr. Nepal, Sikkim, Bhutan, and China.

Bazzania ovistipula (Steph.) Abeywickrama: Fl. E. Himal. **2**: 226 (1971).

Nepal. Basantapur–Dor, 2550 m, on tree-trunks (Jun. 6, 1972).

Distr. S. India, Ceylon, Nepal, Sikkim, Assam, Philippines, and Japan.

Bazzania praerupta (Reinw. et al.) Trev. in Mem. Istit. Lombardo, ser. 3, **4**: 414 (1877).

Bazzania decurva (Nees) Trev.: Fl. E. Himal. 505 (1966).

NEPAL. Suke–Hile Chok, 3570 m, on humus (Jun. 11, 1972); Hile Chok–Ghopte, 3400 m, on humus (Jun. 12, 1972); Ghopte–Gosa, 3700–3970 m, on rocks (Jun. 13, 1972); Saju Pokhari–Topke Gola, 4100 m, on rocks (Jun. 16, 1972).

Distr. S. India, Ceylon, Himalaya (Nepal and Sikkim), Assam, Burma, Sumatra, Java, Borneo, Philippines, Formosa, and Japan.

Bazzania sikkimensis Steph.: Fl. E. Himal. 506 (1966).

NEPAL. Chitre–Basantapur, 2350–2550 m, on tree-trunks (Jun. 6, 1972); Topke Gola–Shewaden, 3350 m, on rotten logs (Jun. 28, 1972).

Distr. Nepal, Sikkim, Bhutan, Assam, and Philippines.

Bazzania tricrenata (Wahlenb.) Trev.: Fl. E. Himal. 506 (1966); **2**: 226 (1971).

NEPAL. Suke–Hile Chok, 3550–3570 m, on rocks (Jun. 11, 1972); Hile Chok–Ghopte, 3350 –3400 m, on humus (Jun. 12, 1972); Ghopte–Gosa, 3700–3970 m, on rocks (Jun. 13, 1972); Banduke Pokhari, 4050–4130 m, in crevices of rock (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4150 m, in crevices of rock (Jun. 15, 1972); Saju Pokhari–Topke Gola, 4100–4350 m, in crevices of rock (Jun. 16, 1972); Topke Gola, 3610 m, on tree-trunks (Jun. 18, 1972); Kipuphu, 4550 m, on rocks (Jun. 26, 1972); Phujeng La, 4750 m, on rocks (Jun. 27, 1972); Topke Gola–Shewaden, 3350 m, on rotten logs (Jun. 28, 1972).

Distr. Europe, S. India, Nepal, Sikkim, China, Formosa, Japan, and N. America.

Bazzania uncigera (Reinw. et al.) Trev. in Mem. Istit. Lombardo, ser. 3, **4**: 415 (1877).

NEPAL. Nessum–Bhuje, 2500 m, on soil (Jul. 3, 1972).

Distr. Himalaya (Nepal), Thailand, Java, Ambon, Borneo, Bangka, Philippines, New Guinea, and Fiji.

Kurzia Makinoana (Steph.) Grolle: Fl. E. Himal. 506 (1966).

NEPAL. Suke–Hile Chok, 3570 m, on humus (Jun. 11, 1972); Ghopte–Gosa, 3970 m, on rocks (Jun. 13, 1972); Gosa–Banduke Pokhari, 4050 m, on soil (Jun. 14, 1972); above Topke Gola, 3650 m, on soil (Jun. 18, 1972).

Distr. Europe, Nepal, Sikkim, Formosa, Japan, and N. America. New to Nepal.

Lepidozia reptans (L.) Dum.: Fl. E. Himal. 506 (1966); **2**: 226 (1971).

NEPAL. Dor–Chauke, 2650 m, on soil (Jun. 7, 1972); below Lamo Pokhari, 2730 m, on rotten tree (Jun. 9, 1972); Gosa–Banduke Pokhari, 4050 m, on soil (Jun. 14, 1972); Saju Pokhari–Topke Gola, 4350 m, on rocks (Jun. 16, 1972); below Thudam, 3250 m, on soil (Jun. 25, 1972); Topke Gola–Shewaden, 3250 m, on rotten logs (Jun. 28, 1972); Papung–Bir Gaon, 1800 m, on rocks (Jun. 30, 1972).

Lepidozia robusta Steph.: Fl. E. Himal. 506 (1966); **2**: 226 (1971).

NEPAL. Ghopte–Gosa, 3700 m, on rocks (Jun. 13, 1972); Topke Gola–Shewaden, 3400 m, on rocks (Jun. 28, 1972).

Distr. Himalaya (Nepal, Sikkim, Bhutan) and China (Yunnan).

CALYPOGEIACEAE (by Sinske Hattori)

Calypogeia lunata Mitt. in Journ. Linn. Soc. Bot. **5**: 107 (1861).

NEPAL. Mossy forest below Lamo Pokhari, 2850 m, on bank (Jun. 9, 1972); Topke Gola, coniferous forest side of a pond, 3600 m, in crevices of rocks (Jun. 19, 1972).

Distr. India, Nepal, Sikkim, and China (Yunnan and Hokin).

Metacalypogeia alternifolia (Nees) Grolle: Fl. E. Himal. 507 (1966).

Nepal. Chitre-Basantapur, 2350 m, on decaying tree (Jun. 6, 1972); mossy forest below Lamo Pokhari, 2630 m, on soil (Jun. 6, 1972); Dor-Chauke, 2650 m, on soil (Jun. 7, 1972); Suke-Hile Chok, 3570 m, on humus (Jun. 11, 1972); Hile Chok-Ghopte, 3350-3500 m, on soil, rocky cliff, and in crevices of cliff (Jun. 12, 1972); Ghopte-Gosa, 3750 m, on soil, humus, and rock (Jun. 13, 1972); Banduke Pokhari-Saju Pokhari, 4010-4220 m, on soil and rock (Jun. 15, 1972); Saju Pokhari-pass to Topke Gola, 4350 m, on rock (Jun. 16, 1972); coniferous forest above Topke Gola, 3600-3650 m, on soil and rock (Jun. 18, 1972); forest below Thudam, 3250 m, on soil (Jun. 25, 1972); around Kipuphu, 4550 m, in crevices of rocks (Jun. 26, 1972); Topke Gola-Shewaden, 2850-3350 m, on rock and rotten logs (Jun. 28, 1972).

LOPHOZIACEAE (by Naofumi Kitagawa)

Anastrepta orcadensis (Hook.) Schiffn.: Fl. E. Himal. 507 (1966); **2**: 226 (1971).

Nepal. Suke-Hile Chok, 3600 m, on humus (Jun. 11, 1972); Ghopte-Gosa, 3750 m, 3800 m, on rock (Jun. 13, 1972); Banduke Pokhari-Saju Pokhari, 4220 m (Jun. 15, 1972); in a coniferous forest above Topke Gola, 3600 m, 3610 m, on tree-trunk, rock and soil, rotten log (Jun. 18, 1972); around Kipuphu, 4500 m, on rock (Jun. 26, 1972); around Phujeng La, 4800 m, in rock-crevices (Jun. 27, 1972); Topke Gola-Shewaden, 3250 m, 3300 m, on rotten log, tree-trunk (Jun. 28, 1972); Thale Patil-Mangen, 3100 m-3400 m (Aug. 27, 1972).

Distr. Europe, Himalaya, Tibet, China (Yunnan, Szechuan), Formosa, Japan, N. America (Pacific coast of Alaska), and Hawaii.

Anastrophyllum assimile (Mitt.) Steph.: Fl. E. Himal. 507 (1966); **2**: 227 (1971).

Nepal. Ghopte-Gosa, 3750 m, 3970 m, on soil and rock (Jun. 13, 1972); Gosa-Banduke Pokhari, 4080 m, in crevices of cliff (Jun. 14, 1972); Banduke Pokhari-Saju Pokhari, 4150 m, 4170 m, on rock (Jun. 15, 1972); Saju Pokhari-pass to Topke Gola, 4100 m, 4350 m, on rock (Jun. 16, 1972); on a slope above Jalang Chhyongo, 4350 m, on soil (Jun. 21, 1972); Lama Chungbu-Slesa, 4250 m, on rock (Jun. 24, 1972); around Kipuphu, 4450 m, on rock (Jun. 26, 1972); Kipuphu-Phujeng La, 4650 m, on soil (Jun. 27, 1972); Topke Gola-Shewaden, 3150 m, on rock (Jun. 28, 1972); Gosainkund-Gopte, 3500-4200 m (Aug. 25, 1972).

Darjeeling. Sandakphu-Phalut, 3200-3600 m (Aug. 2, 1972).

Distr. Europe (Norway, Alps), Himalaya, Borneo (Mt. Kinabalu), Korea, Japan, Alaska, and Greenland.

Anastrophyllum bidens (Nees) Steph.: Fl. E. Himal. **2**: 227 (1971).

Nepal. Hile Chok-Ghopte, 3350-3400 m, on rock, humus (Jun. 12, 1972).

Distr. Himalaya (Nepal and Bhutan), Borneo, Java, Malay, Philippines, and Japan.

Anastrophyllum Donianum (Hook.) Schiffn.: Fl. E. Himal. 507 (1966); **2**: 227 (1971).

Nepal. Suke-Hile Chok, 3600 m, on humus (Jun. 11, 1972); Hile Chok-Ghopte, 3350 m, on rock (Jun. 12, 1972); Ghopte-Gosa, 3700 m, 3750 m, 3970 m, on rock and soil (Jun. 13, 1972); Banduke Pokhari-Saju Pokhari, 4150 m, on soil (Jun. 15, 1972); Saju Pokhari-pass to Topke Gola, 4350 m, on rocky cliff (Jun. 16, 1972); Topke Gola-Shewaden, 3250 m, on rotten log (Jun. 28, 1972); Gopte-Thale Patil, 3400-

3500 m (Aug. 26, 1972).

Distr. Europe (Atlantic coast), Himalaya, Tibet, China (Yunnan), and N. America (Pacific coast of Alaska and Canada).

Anastrophyllum Joergensenii Schiffn.: Fl. E. Himal. 507 (1966).

NEPAL. Ghopte–Gosa, 3750 m, 3970 m, on rock and soil (Jun. 13, 1972); Saju Pokhari–pass to Topke Gola, 4100 m, 4250 m, on rock (Jun. 16, 1972); Lama Chungbu–Slesa, 4250 m, on rock (Jun. 24, 1972); around Kipuphu, 4500 m, on soil (Jun. 26, 1972).

Andrewsianthus ferrugineus Grolle in Ergebn. Forsch.-Unt. Nepal Himal. **1**: 275 (1966).

NEPAL. In a coniferous forest above Topke Gola, 3610 m, on tree-trunk (Jun. 18, 1972).

Distr. Endemic to Nepal.

Chandonanthus birmensis Steph.: Fl. E. Himal. 508 (1966).

NEPAL. Bir Gaon–Dingla, 1300 m, on rock (Jul. 1, 1972); around Sanguri Bhanjyang, 1200 m, on rock (Jul. 10, 1972).

Chandonanthus filiformis Steph.: Fl. E. Himal. 508 (1966); **2**: 227 (1971).

C. pusillus Steph., Sp. Hepat. **3**: 646 (1909).

NEPAL. Hile Chok–Ghopte, 3400 m, on rock (Jun. 12, 1972); Ghopte–Gosa, 3750 m, 3850 m, on rock, and humus (Jun. 13, 1973); around Banduke Pokhari, 4050 m, 4120 m, in crevices of cliff (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4200 m, 4220 m, in crevices of cliff, on rock (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4100 m, in rock-crevices (Jun. 16, 1972); in a coniferous forest above Topke Gola, 3610 m, on tree-trunk (Jun. 18, 1972); Lama Chungbu–Slesa, 4250 m, on rock (Jun. 24, 1972); around Kipuphu, 4550 m, in rock-crevices (Jun. 26, 1972); Phujeng La–Topke Gola, 4760 m, on soil-covered rocks (Jun. 27, 1972); around Phujeng La, 3800 m, in rock-crevices (Jun. 27, 1972).

Distr. Borneo (Mt. Kinabalu), Himalaya, China (Yunnan, Szechuan), Formosa, Japan, and N. America (Pacific coast of Canada).

Chandonanthus hirtellus (Web.) Mitt.: Fl. E. Himal. 508 (1966); **2**: 227 (1971).

NEPAL. Near Sanguri Bhanjyang, 1270 m, on rock (Jun. 2, 1972); Dor–Chauke, 2650 m, on rock (Jun. 7, 1972); Chauke–Lamo Pokhari, 2620 m, 2850 m, on rock, tree-trunk (Jun. 8, 1972); Lamo Pokhari–Gupha Pokhari, 2830 m, on bank (Jun. 10, 1972); Ghopte–Gosa, 3800 m, on rock (Jun. 13, 1972); Topke Gola–Shewaden, 3450 m, on rock (Jun. 28, 1972); Bhorlang–Sundarijar, 2400–1400 m (Aug. 31, 1972).

Isopaches decolorans (Limpr.) Buch in Mem. Soc. F. Fl. Fenn. **8**: 288 (1932).

NEPAL. Shewaden–Papung, 2350 m, on bank (Jun. 29, 1972).

Distr. Europe (Norway, Alps) and Himalaya (Nepal).

This species has been known only from very limited areas in Europe, where it occurs very rarely. Himalayan plants fully exhibit such characteristic features as the silver-green plants somewhat appearing like *Prasanthus* in habit, the very strongly concave, rounded leaves bilobed shallowly and asymmetrically, the hyaline marginal leaf-cells whose walls are very strongly thickened (median and basal cells are rather thin-walled), the cylindrical-ovoid, deeply pluriplicate perianth whose upper portion is hyaline and whose mouth is shallowly lobed but otherwise subentire. Both male and female plants together with sterile shoots with gemmae are found in the Himalayan collection—the female plants often bearing mature sporophytes.

Jamesoniella nipponica Hatt.: Fl. E. Himal. **2**: 227 (1971).

NEPAL. Hile Chok–Ghopte, 3400 m, on humus (Jun. 12, 1972); in a coniferous forest above Topke Gola, 3600 m, 3610 m, on tree-trunk, rotten log (Jun. 18, 1972); Lama Chungbu–Slesa, 4250 m, on soil (Jun. 24, 1972); Topke Gola–Shewaden, 3250 m, on rotten log (Jun. 28, 1972).

Distr. Himalaya, Borneo (Mt. Kinabalu), Formosa, and Japan.

Lophozia Handelii Herz. in Hand.-Mzt., Symb. Sin. **5**: 14 (1930).

NEPAL. Suke–Hile Chok, 3600 m, on humus (Jun. 11, 1972); Gosa–Banduke Pokhari, 4050 m, on rock (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola, 4200 m, on rock (Jun. 16, 1972); in a *Rhododendron* forest above Topke Gola, 3650 m, on soil (Jun. 18, 1972); around Kipuphu, 4500 m, on soil (Jun. 26, 1972); Phujeng La–Topke Gola, 4700 m, in rock-crevices (Jun. 27, 1972).

Distr. Himalaya (Nepal) and China (Yunnan).

Lophozia incisa (Schrad.) Dum.: Fl. E. Himal. 509 (1966).

NEPAL. Hile Chok–Ghopte, 3500 m, on rock (Jun. 12, 1972); Gosa–Banduke Pokhari, 4050 m, on humus (Jun. 14, 1972); in a coniferous forest above Topke Gola, 3600 m, on rotten log (Jun. 18, 1972); Janga La–Thudam, 4550 m, 4600 m, on soil (Jun. 21, 1972); Lama Chungbu–Slesa, 4350 m, on soil (Jun. 24, 1972).

Distr. Europe, Himalaya, China (Yunnan, Szechuan), Formosa, Japan, Korea, Saghalien, Siberia, N. America, and Greenland.

Lophozia setosa (Mitt.) Steph.: Fl. E. Himal. 509 (1966).

NEPAL. Dor–Chauke, 2850 m, on humus (Jun. 7, 1972); in a mossy forest below Lamo Pokhari, 2680 m, on soil (Jun. 9, 1972); Hile Chok–Ghopte, 3500 m, on rock (Jun. 12, 1972); in a coniferous forest above Topke Gola, 3610 m, on rock and soil (Jun 18, 1972); Topke Gola, coniferous forest side of pond, 3600 m, on decorticated log (Jun. 19, 1972); Shewaden–Papung, 2500 m, on rock (Jun. 29, 1972); Thale Patil–Mangen, 3400–3100 m (Aug. 27, 1972).

Sphenolobopsis himalayensis N. Kitag., sp. nov. [Fig. 24]

Planta dioica, minor, gracilis, brunnea, superne flavo-brunnea, intricate caespitosa. Caulis ad 18 mm longus, pauciramosus, plerumque lateraliter (typo *Frullaniae*) et furcate ramosus. Folia caulina remota, transverse inserta, conduplicatim oblique vel squarrose patula, in plano magis lata quam longa, 350–600 μ longa, 380–650 μ lata, 1/3–1/2 subaequaliter biloba, lobis subacutis vel acutis, valde divergentibus, itaque sinu latissimo. Cellulae apicales 10.0–14.5 μ, medianae 18.5–25.0 ×12.0–18.5 μ, basales 20.0–27.5 ×12.5–16.5 μ, parietibus subaequaliter incrassatis, trigonis parum distinctis, cuticula sublaevi. Amphigastria sporadica, magna. Androecia mediana, bracteis 2–3-jugis, valde ventricosis et hemisphaericis; antheridia solitaria, magna, pedicellis brevibus, uniseriatis. Folia floralia erectoamplectentia, caulinis majora, bi- vel triloba, lobis acutis, margine integris vel hic illic dentatis. Perianthia alte emersa, oblongo-obovata, inflata, superne pluriplicata, ore contracto, breviter lobulato, lobulis dentato-cliatis. Capsula valvulis bistratosis, parietibus strati exterioribus incrassatis et praeditis nodulis numerosis, magnis (nodulis strati interioribus parvulis). Sporae rufo-brunneae, 15.0–16.0 μ,

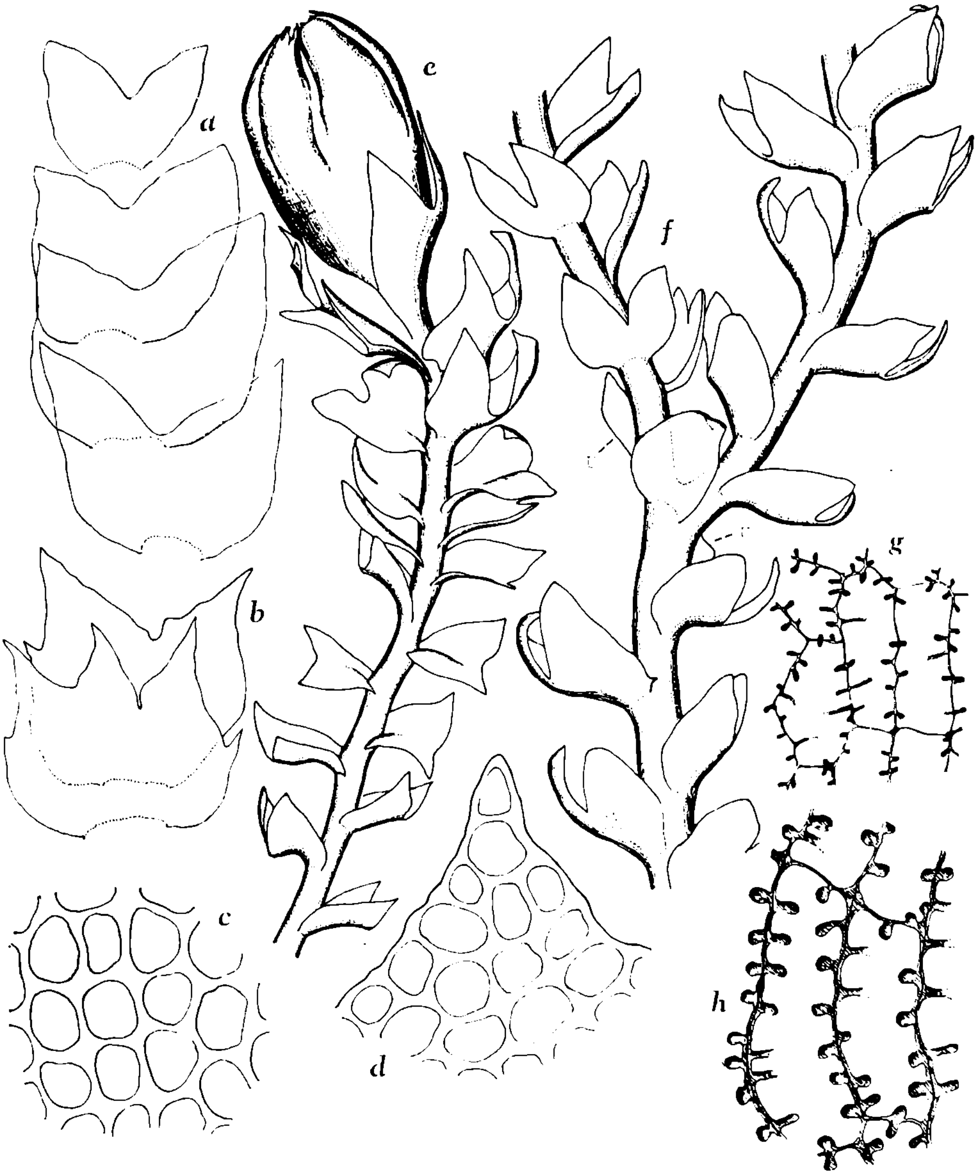

Fig. 24. *Sphenolobopsis himalayensis* N. Kitag. a. Leaves, ×50, b. Pair of female bracts, ×30, c. Cells of leaf-middle, ×450, d. Cells of leaf-apex, ×450, e. Part of female plant, ×30, f. Part of sterile plant with two underleaves at U, ×50, g. Cells of inner layer of capsule-wall, ×450, h. Cells of outer layer of capsule-wall, ×450. All drawn from the type.

dense minuteque papillatae. Elateres bispiri, 7.8–8.5 μ lati.

NEPAL. Banduke Pokhari–Saju Pokhari, 4010 m, on tree (Jun. 15, 1972–type in NICH 312022); Saju Pokhari–pass to Topke Gola, 4150 m, on rock (Jun. 16, 1972); in a coniferous forest above Topke Gola, 3610 m, on tree-trunk (Jun. 18, 1972); Phujeng La–Topke Gola, 4700 m, in rock-crevices (Jun. 27, 1972); Thale Patil–Mangen, 3100–3400 m (Aug. 27, 1972).

Distr. Endemic to Nepal.

This is the second species of *Sphenolobopsis* which was recently described (Schuster 1971). The type species, *S. Pearsonii*, had been known only from Europe but recently it was recorded from several other disjunct areas including North Borneo

(Kitagawa 1970). *S. himalayensis* differs from *S. Pearsonii* in the following features (Bornean material was used for comparison, because mature female inflorescences and sporophytes were not known in any other material). The plants are larger, especially the female plants being often nearly as large as *Sphenolobus minutus*. The leaves possess strongly divergent lobes (thus they are much wider) and *in situ* they are more widely spreading and frequently squarrose. The antheridium is much larger (ca. 160 ×125 μ in *S. himalayensis*, while ca. 80 ×60 μ in *S. Pearsonii*); this large antheridium with a short stalk (ca. 50 μ long) recalls again *Sphenolobus* rather than *Sphenolobopsis*. Although underleaves are occasionally developed even in sterile plants, the female inflorescences lack bracteoles and instead the bracts are often trilobed (in *S. Pearsonii*, bracteoles are present and bracts are bilobed).

The relatively large size of plants suggests that the present species may be placed in *Sphenolobus* (indeed, the species somewhat resembles *Sphenolobus minutus*). However, to assign it to *Sphenolobopsis* may be warranted by the furcate branching of the *Frullania* type, the sporadic occurrence of underleaves, and the bistratose capsule-wall whose inner layer bears small nodular thickenings (not semiannular bands). One of the diagnostic features of *Sphenolobopsis* is the seta composed of a small number (9–10) of cell-rows. Unfortunately, the setae of Himalayan material are all shriveled and impossible to demonstrate the inner structure.

Sphenolobus minutus (Schreb. ex Crantz) Berggr., New Zealand Hepat. 22 (1898).

Anastrophyllum minutum (Schreb. ex Crantz) Schust.: Fl. E. Himal. 508 (1966); **2**: 227 (1971).

NEPAL. Hile Chok–Gopte, 3400 m, on humus (Jun. 12, 1972); Ghopte–Gosa, 3750 m, 3970 m, on rock and soil (Jun. 13, 1972); Banduke Pokhari–Saju Pokhari, 4150 m, 4200 m, in crevices of cliff (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4350 m, on rock (Jun. 16, 1972); on a slope above Jalang Chhyongo, 4350 m, 4550 m, on soil and rock (Jun. 21, 1972); around Kipuphu, 4550 m, on soil-covered rocks (Jun. 26, 1972); around Phujeng La, 4750 m, 4800 m, in rock crevices, on soil (Jun. 27, 1972).

Distr. S. Africa, Europe, Himalaya, Borneo (Mt. Kinabalu), New Guinea, Japan, Siberia, N. America, and Greenland.

Tritomaria exsecta (Schmid.) Schiffn.: Fl. E. Himal. 509 (1966); **2**: 227 (1971).

NEPAL. Banduke Pokhari–Saju Pokhari, 4220 m, on rock (Jun. 15, 1972); around Phujeng La, 4750 m, on soil (Jun. 27, 1972).

Distr. Europe, Himalaya, Borneo (Mt. Kinabalu), Formosa, Japan, Korea, Siberia, and N. America.

CEPHALOZIELLACEAE (by Naofumi Kitagawa)

Cephaloziella Massalongoi (Spr.) K. Muell. in Rabenhorst, Krypt.-Fl. ed. 2, **6**: 191 (1913).

NEPAL. Hile Chok–Ghopte, 3350 m, on rock (Jun. 12, 1972).

Distr. Europe and Nepal.

This species is previously known only from Europe. A small quantity of material was found in the Himalayan collection. The leaf-cells are somewhat larger (10–

14 ×8–10 μ in leaf-middle) but other vegetative features (plants are sterile) agree well with European material.

JUNGERMANNIACEAE (by Tairoku Amakawa)

Horikawaella grosse-verrucosa Amakawa et Hattori, sp. nov. [Fig. 25]
Planta minor, gracillima, rubra, dense caespitans. Caulis ascendens, ad 1.2 cm longus, 0.15 mm in diametro, cum foliis 0.5–0.6 mm latus, ramis laterali-intercalaribus; cortex pachydermis, distincte verrucosus, radicellis sparsis, longis, hyalinis vel rubrescentibus. Folia caulina leviter incuba, sinuatim inserta, oblique patula, ±conduplicatim concava, in plano ovata, 0.35 mm longa, 0.28–0.3 mm lata, apice anguste obtusa, margine ventrali anguste decurva. Cellulae foliorum marginales 7.5–12.5 ×10–12.5 μ, mediae 12.5–15 ×15–25 μ, basales 10–15 ×25–35 μ, parietibus leptodermibus, trigonis nodulosis, cuticula grosse verrucosa. Dioica. Androecia terminalia vel intercalaria; bracteae 3–5 jugae, foliis caulinis majores, valde ventricosae. Gynoecia terminalia; perianthia semi-exserta, fusiformia, 1.2 mm longa, 0.6 mm lata, 4-plicata, ore rostrato; perigynium erectum; bracteae 2 jugae, foliis caulinis conformes.

Nepal. Ghopte–Gosa, 3970 m (Jun. 13, 1972); Banduke Pokhari–Saju Pokhari, 4150 m (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4350 m (Jun. 16, 1972); around Kipuphu, 4550 m (Jun. 26, 1972–type in NICH 312664; dupl. in TI).

Distr. E. Nepal.

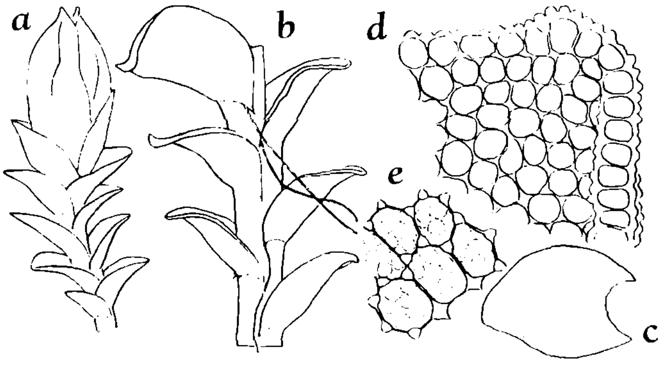

Fig. 25. *Horikawaella grosse-verrucosa* Amak. et Hatt. a. Female plant, dorsal view, ×16, b. Part of stem, ventral view, ×40, c. Leaf, ×40, d. Cells of leaf apex, ×320, e. Cells of leaf-middle, ×320. Drawn from the type.

Horikawaella grosse-verrucosa, the second species of the genus, is similar to a member of the subgenus Solenostoma of the genus *Jungermannia,* but it is easily distinguished from any species of Solenostoma by the conspicuous verrucae covering not only stem-leaves but also the stem-cortex and perianths. *H. subacuta,* the type species of the genus, is larger than *H. grosse-verrucosa,* and has cordiform leaves with subacute apices.

Horikawaella subacuta (Herz.) Hatt. et Amak. in Miscel. Bryol. Lichenol. **5**: 164 (1971).

Anastrophyllum subacutum Herz. in Ann. Bryol. **12**: 75 (1939).

Nepal. Saju Pokhari–Topke Gola, 4350 m (Jun. 11, 1972); Hile Chok–Ghopte, 3400 m (Jun. 12, 1972); Gosa-Banduke Pokhari, 4050 m (Jun. 13, 1972); Banduke Pokhari-Saju Pokhari, 4150 m (Jun. 15, 1972); around Kipuphu, 4500 m (Jun. 26, 1972).

Distr. Sikkim and Nepal.

Jungermannia appressifolia Mitt. in Journ. Linn. Soc. Bot. **5**: 91 (1861).

J. Decolyana Schiffn.: Fl. E. Himal. 510 (1966); **2**: 227 (1971).

NEPAL. Hile Chok-Ghopte, 3450 m (Jun. 12, 1972).

var. **nigricans** (Amak.) Váňa in Journ. Hattori Bot. Lab. **36**: 58 (1972).

J. Decolyana var. *nigricans* Amak.: Fl. E. Himal. **2**: 228 (1971).

NEPAL. Chitre-Basantapur, 2350 m (Jun. 6, 1972); Suke-Hile Chok, 3000 m (Jun. 11, 1972).

Distr. Var. *appressifolia*: E. Himalaya, India (Bengal and Assam), Yunnan, Ceylon, Java, Borneo, Formosa, and Japan; var. *nigricans*: E. Himalaya (Nepal) and India (Bengal).

Jungermannia atrobrunnea Amak. in Journ. Hattori Bot. Lab. **30**: 192 (1967).

NEPAL. Ghopte-Gosa, 3750–4020 m (Jun. 13, 1972); around Kipuphu, 4550 m (Jun. 26, 1972).

Distr. Nepal and Bengal.

Jungermannia bengalensis Amak. in Journ. Hattori Bot. Lab. **31**: 112 (1968).

J. filamentosa Amak. l.c. **30**: 194 (1967), non Lehm. et Lindenb. in Lehm., Pugillus **6**: 29 (1834).

NEPAL. Ghopte-Gosa, 3700 m (Jun. 13, 1972); above Topke Gola, 3610 m (Jun. 18, 1972).

Distr. Nepal and Bengal.

Jungermannia confertissima Nees in Naturg. Eur. Leberm. **1**: 277 (1833).

J. Duthiana Steph.: Amak. l.c. **30**: 196 (1967).

NEPAL. Lamo Pokhari-Gupha Pokhari, 2830 m (Jun. 10, 1972).

Distr. Europe, Kashmir, Himalaya, Siberia, and N. America.

Jungermannia flavorevoluta Váňa in Journ. Hattori Bot. Lab. **36**: 63 (1972).

J. clavellata (Mitt.) Amak. sensu Grolle in Journ. Jap. Bot. **40**: 208 (1965)–Amak. in Journ. Hattori. Bot. Lab. **29**: 253 (1966).

NEPAL. Suke-Hile Chok, 3450 m (Jun. 11, 1972); Janga La-Thudam, 4400 m (Jun. 21, 1972); Lama Chungbu-Slesa, 4250 m (Jun. 24, 1972); Topke Gola-Shewaden, 3400 m (Jun. 28, 1972).

Distr. Nepal, Sikkim, and Bhutan.

Jungermannia lanigera Mitt.: Fl. E. Himal. 511 (1966).

NEPAL. Ghopte-Gosa, 4000 m (Jun. 13, 1972); Kipuphu-Phujeng La, 4600 m (Jun. 27, 1972).

Distr. Nepal, Sikkim, Bengal, and W. China (Szechuan and Yunnan).

Jungermannia limbatifolia Amak. in Journ. Hattori Bot. Lab. **31**: 112 (1968).

var. **radicellosa** Amak. in Fl. E. Himal. **2**: 228 (1971).

NEPAL. Near Chitre, 2350 m (Jul. 7, 1972).

Distr. var. Nepal and Bhutan.

Jungermannia macrocarpa Steph.: Amak. in Journ. Hattori Bot. Lab. **30**: 190 (1967).

NEPAL. Hile–Chitre, 2150 m (Jun. 5, 1972); Chitre–Basantapur, 2350 m (Jun. 6, 1972); Shewaden–Papung, 2050 m (Jun. 29, 1972); Bir Gaon–Dingla, 1400 m (Jul. 1, 1972).

Distr. Nepal, Sikkim, Bengal, and W. China (Szechuan and Yunnan).

Jungermannia minutiverrucosa Amak. in Journ. Hattori Bot. Lab. **25**: 390 (1962).

Nardia granulata Steph. in Bull. Herb. Boiss. **5**: 100 (1897).

NEPAL. Bir Gaon–Dingla, 1050 m (Jul. 1, 1972).

Distr. Nepal, Thailand, New Guinea, and Japan.

Jungermannia Ohbae Amakawa, sp. nov. [Fig. 26 a–g]

Planta major, flaccidula, viridis, saepicule rubescens, dense caespitans. Caulis ascendens, 2.5 cm longus, 0.35 mm diametro, cum foliis 1.5–2.5 mm latus, saepicule ramosus et flagellifer, ramis laterali-intercalaribus, sparsim radicellosus. Folia caulina remota vel contigua, sinuatim inserta, dorsale secunda, leviter concava, saepicule ad apicem caulinem ±conduplicatim concava, in plano ovata, 1.5–1.7 mm longa, 1.5–2 mm lata. Cellulae marginales saepe rubri-tinctae, 25–38 ×20–25 μ, mediae 32–60 ×25–45 μ, basales 50–130 ×25–50 μ, leptodermes, trigonis minutis; cuticula laevis. Dioica videtur; perianthia semi-exserta, pyriformia, 1.8 mm longa, 1 mm lata, ore rostrato; bracteae 1 jugae, foliis caulinis conformes; sub flore innovata.

NEPAL. Gosainkund–Gopte, 4200 m (Aug. 25, 1972–type in NICH 312380).

Distr. Nepal.

Jungermannia Ohbae is hygrophilous, growing on rocks of the stream-side. It looks like a species of the subgenus Luridae. The plant is light green, but often tinged with red; the leaves are often bordered by a row of reddish cells.

Jungermannia parvitexta Amak. in Journ. Hattori Bot. Lab. **30**: 187 (1967).

NEPAL. Ghopte–Gosa, 3750 m (Jun. 13, 1972); Banduke Pokhari–Saju Pokhari, 4200 m (Jun. 15, 1972).

Distr. Nepal and Bengal.

Jungermannia pseudodecolyana Amak. in Journ. Hattori Bot. Lab. **30**: 188 (1967).

NEPAL. Gosa–Banduke Pokhari, 4050 m (Jun. 13, 1972).

Distr. Nepal and Bengal.

Jungermannia rubripunctata (Hatt.) Amak. in Journ. Hattori Bot. Lab. **22**: 38 (1960).

NEPAL. Near Chitre, 2350 m (Jul. 7, 1972).

Distr. Nepal and Japan.

Jungermannia saccaticoncava Amakawa, sp. nov. [Fig. 26 h–m]

Sterilis, minor, olivacea, caespitans. Caulis simplex, procumbens, 0.5–0.8 cm longus, cum foliis 1.5 mm latus, dense radicellosus. Folia caulina imbricata, sinuatim transverseque inserta, squarrosa, valde concava, saccatiformia, in plano reniformia, 0.85–0.9 mm longa, 1.3–1.5 mm lata. Cellulae marginales 15–25 ×

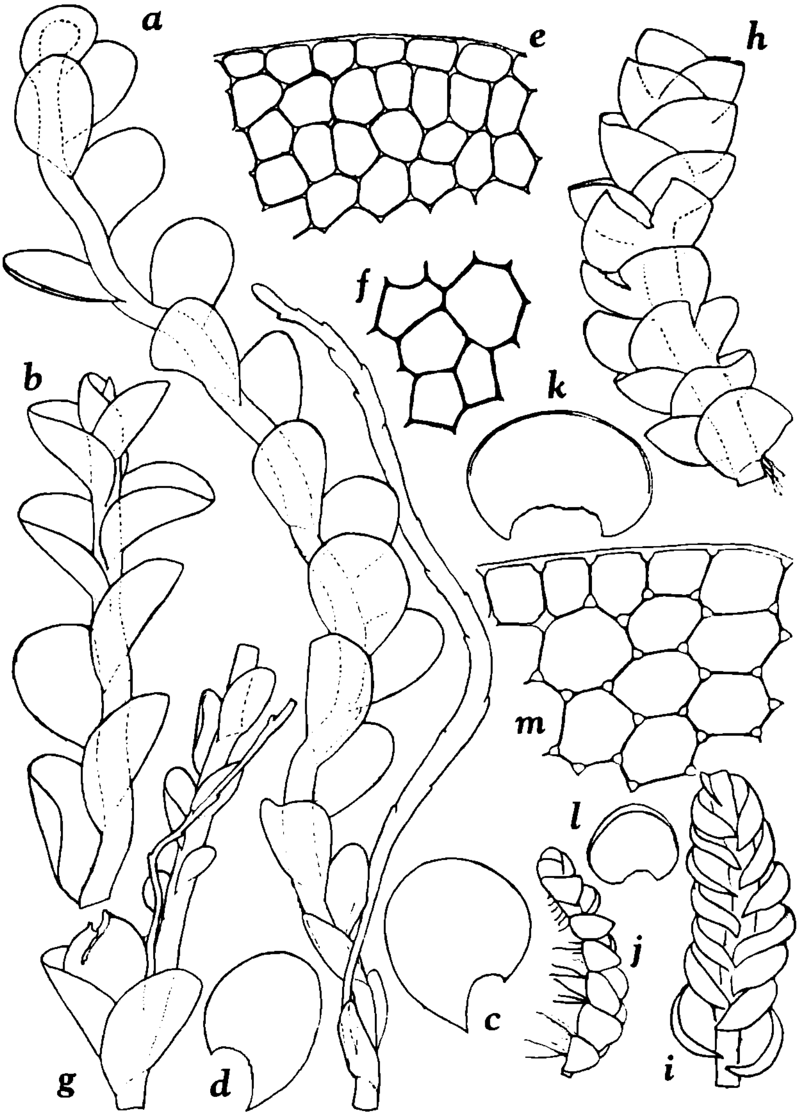

Fig. 26. *Jungermannia Ohbae* Amak. a. Sterile plant with flagellum, lateral view, ×8, b. Part of stem, dorsal view, ×18, c, d. Leaves, ×8, e. Cells of leaf-apex, ×160, f. Cells of leaf-middle, ×160, g. Perianth and bracts, with innovations, dorsal view, ×8.

Jungermannia saccaticoncava Amak. h. Part of sterile plant, dorsal view, ×8, i. Young plant, dorsal view, ×16, j. Young plant, lateral view, ×8, k. Leaf, ×16, l. Leaf of young plant, ×16, m. Cells of leaf-apex, ×320. All figures were drawn from the types.

25–30 μ, mediae 20–25 ×25–30 μ, basales 20–30 ×25–45 μ, parietibus tenuibus, trigonis majoribus, leviter nodulosis; cuticula laevis. Reliqua desunt.

NEPAL. Janga La–Thudam, 4550 m (Jun. 21, 1972–type in NICH 312380).

Distr. Nepal.

The extremely concave, sac-forming leaves are very conspicuous.

Jungermannia sanguinolentha Griff. in Notul. Pl. Asia. 302 (1849).

NEPAL. Ghopte–Gosa, 3700 m (Jun.13, 1972); above Topke Gola, 3610 m (Jun. 18, 1972).

Distr. Nepal, Sikkim, and Assam.

Jungermannia subrubra Steph. in Sp. Hepat. **6**: 93 (1924).

NEPAL. Lama Chungbu-Slesa, 4250 m (Jun. 24, 1972).

Distr. Nepal, Sikkim, and Bengal.

Jungermannia tetragona Lindenb. in Bot. Zeit. **6**: 462 (1848).

NEPAL. Dingla-Doban, 1000 m (Jul. 2, 1972); Nessum-Bhuje, 1550 m (Jul. 3, 1972).

Distr. Nepal, Sikkim, Assam, Ceylon, Andaman, Sumatra, Java, Borneo, Ambon, New Guinea, New Caledonia, and Japan.

Jungermannia truncata Nees in Hepat. Jav. 29 (1830).

NEPAL. Nigale-Kuwa Pani, 1720 m (Jun. 4, 1972); Nessum-Bhuje, 1700 m (Jul. 3, 1972).

Distr. Ceylon, Nepal, Sikkim, Assam, Bengal, Burma, Thailand, Malay, Sumatra, Bangka, Java, Borneo, New Guinea, Philippines, China, Formosa, Korea, and Japan.

Mylia Taylori (Hook.) S.F. Gray: Fl. E. Himal **2**: 228 (1971).

NEPAL. Suke-Hile Chok, 3570 m, on humus (Jun. 11, 1972).

Distr. Circumboreal, southward to Himalayas, China, Formosa (higher elevations), and Japan.

Nardia nepalensis Amakawa, sp. nov. [Fig. 27]

Planta minor, flavo-viridis vel brunnescens, caespitans. Caulis procumbens, 0.8 cm longus, 0.25 mm diametro, cum foliis 1.3 mm latus. Folia caulina contigua vel imbricata, oblique inserta, oblique patula, basi haud decurrentia, leviter concava, rotunda vel quadrato-rotunda, 0.4–0.65 mm longa, 0.5–0.85 mm lata. Cellulae marginales 20–30 ×20–25 μ, mediae 30–38 ×25–35 μ, basales 38–50 ×25–35 μ, parietibus tenuibus, trigonis nodulosis, cuticula laevi. Amphigastria caulina

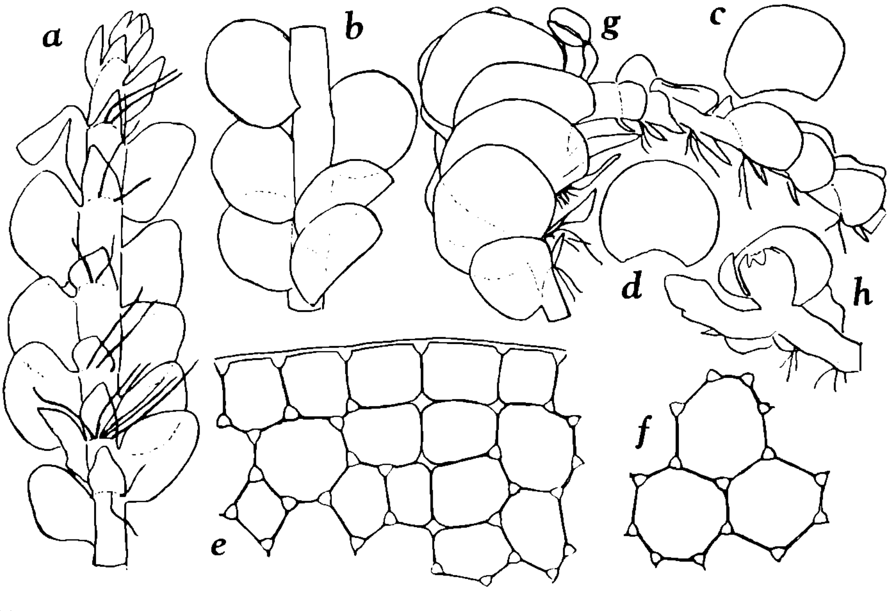

Fig. 27. *Nardia nepalensis* Amak. a. Part of stem, ventral view, × 16, b. Part of stem, dorsal view, × 16, c, d. Leaves, × 16, e. Cells of leaf-apex, × 320, f. Cells of leaf-middle, × 320, g, h. Female plants with young gynoecia and innovations, lateral view, × 16. Drawn from the type.

triangulata, 0.4–0.5 mm longa, 0.3 mm lata, uno latere foliis coalita, apice obtusa. Dioica videtur; gynoecia terminalia, sub flore ventrali omnino uno vel duplo innovata. Perianthia juvenalia, conica; peryginium erectum; folia et amphigastrium floralia caulinis haud diversa, majora.

NEPAL. Banduke Pokhari–Saju Pokhari, 4150 m (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4350 m (Jun. 16, 1972–type in NICH 312067).

Distr. Nepal.

The subfloral innovations from the ventral side of the stem of *Nardia nepalensis* are very remarkable. The species is similar to *N. scalaris*, but the latter has subulate underleaves with acute apices.

Nardia Poeltii Váňa in Journ. Hattori Bot. Lab. **36**: 73 (1972).

NEPAL. Dor–Chauke, 1670 m (Jun. 7, 1972); Ghopte–Gosa, 3800 m (Jun. 13, 1972).

Distr. Nepal.

LOPHOCOLEACEAE (by Naofumi Kitagawa)

Chiloscyphus argutus (Reinw., Bl. et Nees) Nees: Fl. E. Himal. 512 (1966).

NEPAL. Shewaden–Papung, 2250 m, on soil (Jun. 29, 1972).

Chiloscyphus Bescherellei Steph.: Fl. E. Himal. 512 (1966).

NEPAL. Shewaden–Papung, 2250 m, 2500 m, on soil, rock (Jun. 29, 1972).

Chiloscyphus flaccidus (Mitt.) Steph.: Fl. E. Himal. 512 (1966).

NEPAL. Dor–Chauke, 2850 m, on humus (Jun. 7, 1972); Suke, 2900 m, on humus (Jun. 10, 1972).

Distr. Himalaya.

Chiloscyphus inflatus Steph., Sp. Hepat. **3**: 206 (1906).

NEPAL. Hile Chok–Ghopte, 3350 m, on rock (Jun. 12, 1972); Saju Pokhari–pass to Topke Gola, 4200 m, on rock (Jun. 16, 1972); in a forest below Thudam, 3400 m, on tree-trunk (Jun. 22, 1972); around Kipuphu, 4450 m, on rock (Jun. 26, 1972); Kipuphu–Phujeng La, 4650 m, on soil (Jun. 27, 1972); Ramche–Gram, 1800–1900 m (Aug. 20, 1972); Gosainkund–Gopte, 3500–4200 m (Aug. 25, 1972).

Distr. Himalaya.

Chiloscyphus polyanthus (L.) Corda: Fl. E. Himal. 512 (1966).

NEPAL. Topke Gola–Shewaden, 3400 m, on rock (Jun. 28, 1972).

Distr. Europe, Himalaya, China, Formosa, Japan, Korea, Siberia, and N. America.

Lophocolea bidentata (L.) Dum.: Fl. E. Himal. 512 (1966).

NEPAL. In a mossy forest below Lamo Pokhari, 2700 m, on soil (Jun. 9, 1972).

Distr. Africa, Europe, Himalaya, and N. America.

Lophocolea sikkimensis (Steph.) Herz. et Gro.: Fl. E. Himal. 513 (1966).

NEPAL. Suke–Hile Chok, 3570 m & 3600 m, on humus (Jun. 11, 1972); Hile Chok–Ghopte, 3500 m, on rock (Jun. 12, 1972); Ghopte–Gosa, 3700 m & 4000 m, on rotten log, rock (Jun. 13, 1972).

Distr. Himalaya.

PLAGIOCHILACEAE (by Hiroshi Inoue)

Plagiochila Beddomei Steph.: Fl. E. Himal. 513 (1966).

NEPAL. Near Sanguri Bhanjyang, 1200 m (Jun. 2, 1972).

Distr. S. India, Sikkim, and Thailand.

Plagiochila Cardotii Steph.: Fl. E. Himal. 514 (1966).

NEPAL. Hile-Chitre, 2310 m (Jun. 5, 1972); below Lamo Pokhari, 2680 m (Jun. 9, 1972).

Plagiochila Carringtonii (Balfour) Grolle

subsp. **lobuchensis** Grolle: Fl. E. Himal. 514 (1966).

NEPAL. Saju Pokhari-pass to Topke Gola, 4150 m (Jun. 16, 1972); Lama Chungbu-Slesa, 4250 m (Jun. 24, 1972).

Plagiochila chinensis Steph.: Fl. E. Himal. 514 (1966).

NEPAL. Shewaden-Papung, 2700 m (Jun. 29, 1972); in a forest near Chitre, 2400 m (Jul. 7, 1972).

Plagiochila cuspidata Steph., Sp. Hepat. **6**: 144 (1918)-Inoue in Journ. Hattori Bot. Lab. **30**: 128 (1967).

P. subsymmetrica Steph.: Fl. E. Himal. 520 (1966); **2**: 229 (1971).

NEPAL. Near Sanguri Bhanjyang, 1200 m (Jun. 2, 1972).

Distr. E. Nepal, Sikkim, and Thailand.

Plagiochila debilis Mitt.: Fl. E. Himal. 514 (1966).

NEPAL. Dor-Chauke, 2850 m (Jun. 7, 1972); above Topke Gola, 3650 m (Jun. 18, 1972).

Plagiochila denticulata Mitt.: Fl. E. Himal. 515 (1966).

NEPAL. Shewaden-Papung, 2400 m (Jun. 29, 1972).

Distr. E. Nepal, Sikkim, and Bengal.

Plagiochila Determii Steph.: Fl. E. Himal. 515 (1966).

NEPAL. Hile-Chitre, 2000 m (Jun. 5, 1972); Dor-Chitre, 2500 m (Jul. 7, 1972).

Distr. E. Himalaya, Thailand, and China (Yunnan).

Plagiochila Duthiana Steph. : Fl. E. Himal. **2**: 229 (1971).

NEPAL. Banduke Pokhari-Saju Pokhari, 4100 m (Jun. 15, 1972); Saju Pokhari-Topke Gola, 3600 m (Jun. 16, 1972); above Topke Gola, 3650 m (Jun. 18, 1972); Lama Chungbu-Slesa, 4250 m (Jun. 24, 1972); Topke Gola-Shewaden, 3150 m (Jun. 28, 1972); Shewaden-Papung, 2500 m (Jun. 29, 1972).

Plagiochila elegans Mitt.: Fl. E. Himal. 515 (1966).

NEPAL. Topke Gola-Shewaden, 2850 m (Jun. 28, 1972); Shewaden-Papung, 2600 m (Jun. 29, 1972); near Chitre, 2400 m (Jul. 7, 1972).

Plagiochila firma Mitt.: Fl. E. Himal. 515 (1966); **2**: 229 (1971).

NEPAL. Basantapur-Dor, 2550 m (Jun. 6, 1972); below Lamo Pokhari, 2850 m (Jun. 9, 1972); above Topke Gola, 3610 m (Jun. 18, 1972); below Thudam, 3250 m (Jun. 25, 1972); Topke Gola-Shewaden, 3300 m (Jun. 28, 1972); Mangen-Khodang Danda, 3100-2500 m (Aug. 28, 1972).

DARJEELING. 2200 m (Jul. 28, 1972).

Distr. Himalaya, Thailand, China, Formosa, and Japan.

Plagiochila flexuosa Mitt.: Fl. E. Himal. 516 (1966).

NEPAL. Hile-Chitre, 2350 m (Jun. 5, 1972); Dor-Chauke, 2850 m (Jun. 7, 1972); Shewaden-Papung, 2500 m (Jun. 29, 1972).

Distr. E. Himalaya, Bengal, Thailand, Formosa, and Japan.

Plagiochila fragillima Steph., Sp. Hepat. **2**: 326 (1904)-Inoue in Bull. Nat. Sci. Mus. Tokyo **8**: 387 (1965).

NEPAL. Below Thudam, 3250 m (Jun. 25, 1972).

Distr. E. Nepal and Sikkim.

Plagiochila Gollanii Steph.: Fl. E. Himal. 516 (1966).

NEPAL. Near Sanguri Bhanjyang, 1200–1300 m (Jun. 2, 1972); Hile–Chitre, 2250 m (Jun. 5, 1972); Chitre–Basantapur, 2350 m (Jun. 6, 1972); Dor–Chitre, 2500 m (Jun. 7, 1972).

Distr. E. Himalaya, Bengal, Thailand, Formosa, and Japan.

Plagiochila Grollei Inoue: Fl. E. Himal. 517 (1966); **2**: 229 (1971).

NEPAL. Below Lamo Pokhari, 2650 m (Jun. 9, 1972); Suke–Hile Chok, 3570 m (Jun. 11, 1972); Hile Chok–Ghopte (Tal Pokhari), 3350 m (Jun. 12, 1972); Topke Gola–Shewaden, 3150 m (Jun. 28, 1972).

Plagiochila microphylla Steph.: Fl. E. Himal. 517 (1966).

NEPAL. Suke–Hile Chok, 3550 m (Jun. 11, 1972); above Topke Gola, 3650 m (Jun. 18, 1972); Phulchoki, summit area, 2650 m (Jul. 15, 1972).

Plagiochila mundaliensis Steph.: Fl. E. Himal. 517 (1966).

NEPAL. Below Thudam, 3250 m (Jun. 25, 1972); Topke Gola–Shewaden, 3050 m (Jun. 28, 1972).

Plagiochila neorupicola Inoue: Fl. E. Himal. 517 (1966).

NEPAL. Near Sanguri Bhanjyang, 1270 m (Jun. 2, 1972).

Plagiochila nepalensis Lindenb.: Fl. E. Himal. 517 (1966).

NEPAL. Near Sanguri Bhanjyang, 1200 m (Jun. 2, 1972); Kuwa Pani–Hile, 1900 m (Jun. 4, 1972); near Chitre, 2400 m (Jul. 7, 1972).

Distr. E. Himalaya to S. India, Thailand, W. China, and Philippines.

Plagiochila orientalis Tayl.: Fl. E. Himal. 518 (1966); **2**: 229 (1971).

NEPAL. Suke–Hile Chok, 2970 m (Jun. 11, 1972); Topke Gola–Shewaden, 3300 m (Jun. 28, 1972); Phulchoki, summit area, 2400 m (Jul. 15, 1972).

Distr. Nepal, Bhutan, Assam, and N. Thailand.

Plagiochila perserrata Herz.: Fl. E. Himal. 518 (1966); **2**: 229 (1971).

NEPAL. Dor–Chauke, 2850 m (Jun. 7, 1972); Topke Gola–Shewaden, 2800 m (Jun. 28, 1972); Shewaden–Papung, 2300 m (Jun. 29, 1972).

Plagiochila phalangea Tayl.: Fl. E. Himal. 518 (1966).

NEPAL. Below Lamo Pokhari, 2700 m (Jun. 9, 1972); Papung–Bir Gaon, 1800 m (Jun. 30, 1972).

Plagiochila Pocsii Inoue in Journ. Hattori Bot. Lab. **31**: 304 (1968).

NEPAL. Chauke–Lamo Pokhari, 2620 m (Jun. 8, 1972); below Lamo Pokhari, 2680 m (Jun. 9, 1972); Thudam, 3420 m (Jun. 22, 1972); Thudam, 3250 m (Jun. 25, 1972).

Distr. E. Nepal, N. Vietnam, and Thailand. This is a new record for Himalaya. The Himalayan plants sometimes have few terminal branches.

Plagiochila Poeltii Inoue et Grolle in Grolle in Trans. Brit. Bryol. Soc. **4**: 656 (1964)–Inoue, l.c. 395 (1965).

NEPAL. Ghopte–Gosa, 4000 m (Jun. 13, 1972); around Banduke Pokhari, 4200 m (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4100 m (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4200 m (Jun. 16, 1972); Lama Chungbu–Slesa, 4250 m (Jun. 24, 1972); below Thudam, 3230 m (Jun. 25, 1972); Topke Gola–Shewaden, 3400 m (Jun. 28, 1972).

Distr. E. Nepal.

Plagiochila pseudofirma Herz.: Fl. E. Himal. 518 (1966).

NEPAL. Basantapur–Dor, 2500 m (Jun. 6, 1972); below Lamo Pokhari, 2700 m (Jun. 9, 1972); above Topke Gola, 3600 m (Jun. 18, 1972); below Thudam, 3250 m (Jun. 25, 1972); Phulchoki, summit area, 2400 m (Jul. 15, 1972).

Plagiochila pseudomicrophylla Inoue in Fl. E. Himal. 518 (1966); in Journ. Hattori Bot. Lab. **30**: 121 (1967).

NEPAL. Below Lamo Pokhari, 2850 m (Jun. 9, 1972); Suke-Hile Chok, 3550 m (Jun. 11, 1972).

Plagiochila pseudorientalis Inoue in Journ. Hattori Bot. Lab. **30**: 126 (1967).

NEPAL. Bir Gaon–Dingla, 1300 m (Jul. 1, 1972).

Plagiochila retusa Mitt.: Fl. E. Himal. 518 (1966).

NEPAL. Below Lamo Pokhari, 2650 m (Jun. 9, 1972); Hile Chok–Ghopte, 3400 m (Jun. 12, 1972); Banduke Pokhari–Saju Pokhari, 4170 m (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4350 m (Jun. 16, 1972); above Topke Gola, 3610 m (Jun. 18, 1972); below Thudam, 3300 m (Jun. 25, 1972); around Kipuphu, 4550 m (Jun. 26, 1972); Thale Patil-Mangen, 3100–3400 m (Aug. 27, 1972).

Distr. E. Nepal, Sikkim, and Bengal.

Plagiochila sciophila Nees: Fl. E. Himal. 518 (1966).

NEPAL. Hile–Chitre, 2150 m (Jun. 5, 1972); Dor–Chauke, 2750 m (Jun. 7, 1972); Chauke–Lamo Pokhari, 2700 m (Jun. 8, 1972).

Plagiochila secretifolia Mitt.: Fl. E. Himal. 519 (1966).

NEPAL. Dor–Chauke, 2600 m (Jun. 7, 1972); below Lamo Pokhari, 2650 m (Jun. 9, 1972).

Distr. Himalaya, Bengal, and N. Thailand.

Plagiochila semidecurrens (Lehm. et Lindenb.) Lehm. et Lindenb.: Fl. E. Himal. 519 (1966).

NEPAL. Dor–Chauke, 2850 m (Jun. 7, 1972); around Lamo Pokhari, 2900 m (Jun. 8, 1972); Chauke–Lamo Pokhari, 2800 m (Jun. 8, 1972); below Lamo Pokhari, 2730 m (Jun. 9, 1972); Hile Chok–Ghopte, 3400 m (Jun. 12, 1972); Ghopte–Gosa, 3700 m (Jun. 13, 1972); above Topke Gola, 3650 m (Jun. 18, 1972); Chauke–Dor, 2700 m (Jul. 6, 1972); Gopte–Thale Patil, 3400–3500 m (Aug. 26, 1972).

Distr. E. Himalaya, Khasia, Bengal, Ceylon, Thailand, China, Formosa, Philippines, Japan, Alaska, and W. Canada.

Plagiochila torquescens Herz.: Fl. E. Himal. 520 (1966); **2**: 229 (1971).

NEPAL. Chitre–Basantapur, 2350 m (Jun. 6, 1972).

Distr. E. Nepal, Sikkim, and China.

Plagiochilion Mayebarae Hatt.: Fl. E. Himal. 521 (1966).

NEPAL. Dor–Chauke, 2850 m (Jun. 7, 1972); around Lamo Pokhari, 2900 m (Jun. 8, 1972); below Lamo Pokhari, 2700 m (Jun. 9, 1972); Suke–Hile Chok, 3550 m (Jun. 11, 1972); Banduke Pokhari–Saju Pokhari, 4100 m (Jun. 15, 1972).

ACROBOLBACEAE (by Sinske Hattori)

Acrobolbus ciliatus (Mitt.) Schiffn.: Fl. E. Himal. 510 (1966).

NEPAL. Forest below Thudam, 3250 m, on rock (Jun. 25, 1972).

Distr. Himalaya, New Guinea, Formosa, Japan, Aleutian Isl. (Attu Isl.), and N. America (Alaska and Appalachians).

ARNELLIACEAE (by Sinske Hattori & Naofumi Kitagawa)

Southbya Gollanii Steph., Sp. Hepat. **3**: 37 (1906).

NEPAL. In a coniferous forest above Topke Gola, 3610–3650 m, on tree-trunk (Jun. 18, 1972).

Distr. Himalaya (Mussoorie and Nepal).

This is the first real record of this species from Nepal (the previous record is not referable to *S. Gollanii* but to *S. Grollei*). Both species are immediately separated by several salient gametophytic features (Kitagawa 1973). The material cited above has mature sporophytes which offer other distinguishing characters; the inner layer of capsule walls bears semiannular bands (nodular thickenings in *S. Grollei*), the spores are granulate-echinate in coats (more highly echinate in *S. Grollei*), and the elaters possess two spiral thickenings (without thickenings in *S. Grollei*).

Southbya Grollei N. Kitag. in Act. Phytotax. Geobot. **25**: 127, f. 1 (1973).

S. Gollanii Steph. sensu Grolle in Ergebn. Forsch.-Unt. Nepal Himal. **1**: 287, f. 8 (1966).

NEPAL. Dor–Chauke, 2750 m, on rocky cliff (Jun. 7, 1972); Chauke–Lamo Pokhari, 2620 m, on rock and rocky cliff (Jun. 8, 1972); Shewaden–Papung, 2200 m, on rock (Jun. 29, 1972); Papung–Bir Gaon, 1900 m, on rock (Jun. 30, 1972).

Distr. Himalaya (Nepal), Thailand, and New Guinea.

ANTHELIACEAE (by Sinske Hattori)

Anthelia Juratzkana (Limpr.) Trev. in Mem. R. Ist. Lombardo ser. 3, **4**: 416 (1877).

NEPAL. Ghopte–Gosa, 3750–3800 m, on soil and rock (Jun. 13, 1972); around Banduke Pokhari, 4120 m, in crevices of rocks (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola, 4350 m, on rocky cliff (Jun. 16, 1972); slope above Jalang Chhyongo, 4400 m, in crevices of cliff (Jun. 21, 1972); Janga La–Thudam, 4550, on soil (Jun. 21, 1972).

Distr. Europe, Himalaya, New Guinea, New Zealand, Japan, Siberia, Kurile, and N. & S. America.

CEPHALOZIACEAE (by Sinske Hattori)

Cephalozia terminalis Hatt., sp. nov. [Fig. 28]

Planta minor, pallide flavescens, dioica, flagellifera; caulis apex saepicule nudus, gemmifer; folia caulina substransverse inserta, haud decurrentia, ovato-oblonga, ca. 1/2-bifida; gynoecia in caule terminalia, bractea intima oblonga, 2/5–1/2-bifida, margine integerrima, bracteola intima bractea simillima, perianthia cylindrica, exserta, ore lato, breviter lobato, lobis crenulatis; androecia intercalaria, bracteis concavis.

Plants small (to medium-sized), in herbaria pale yellow and sometimes red-tinted at least partially, in small patches with *Riccardia* etc. Stems short (5–10 mm), simple, pale olive-yellow, 0.15(–0.18) mm in diameter, prostrate to more or less ascending, with flagella below, rhizoids hyaline, mainly on flagella, stem-apices often nude (without leaves), gemmiferous, branches few, ventral in origin. Stem-leaves contiguous to somewhat remote, obliquely spreading, conduplicate-concave, ovate-oblong, when well-developed ca. 0.8 mm long and 0.6 mm wide, 30–32 cells wide below middle (at widest

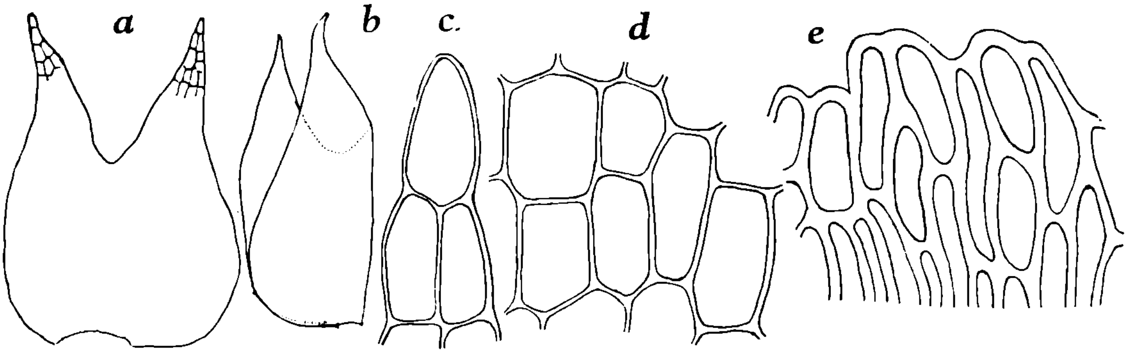

Fig. 28. *Cephalozia terminalis* Hatt. a, b. Stem-leaves, ×46, c. Lobe-apex of stem-leaf, ×385, d. Inner cells of stem-leaf, ×385, e. Mouth-margin of perianth, ×385. Drawn from Type, coll. Z. Iwatsuki no. 919.

portion), 9–10 cells wide at base, ca. 1/2-bifid, sinus subacute, lobes triangular-lanceolate, ventral lobe larger, ca. 10 cells long, 10–14 cells wide at base, with more or less pilose apices, insertion nearly transverse, short, not decurrent; cavities of cells subhyaline, of cells of lobe-middle generally 33–47 × 24 μ, of cells near leaf-base generally 33–43 × 18–24 μ, walls hyaline or nearly so, equally and slightly thickened, trigones small or absent, cuticle smooth. Dioicous. Androecia intercalary, bracts several pairs, smaller, concave. Gynoecia terminal on stems, rarely with subfloral innovation; perichaetial leaves several pairs, larger than stem-leaves, densely imbricate; innermost bract oblong, 1–1.2 mm long and 0.3–0.4 mm wide, 2/5–1/2-bifid, sinus acute and narrow, lobes lanceolate, acute at apex, margin entire throughout; innermost bracteole similar to the bract; perianth exserted, subhyaline or mostly reddish-tinted (mouth always hyaline), but narrow, cylindric, 2–2.5 mm long and 0.4–0.5 mm wide, smooth, mouth wide (ca. 0.35 mm wide), shallowly lobed, lobes crenulate.

NEPAL. Hile Chok–Ghopte, 3350 m, on rocky cliff (Jun. 12, 1972, coll. Z. Iwatsuki no. 919–holotype in NICH, dupl. in TI); Shewaden–Papung, 2500 m, on rotten log (Jun. 29, 1972).

Distr. Endemic.

From the Himalayas and adjacent regions, *C. Gollanii* Steph., *C. Herzogiana* Pandé et Srivastava, and several other species of *Cephalozia* have been known. However, the present new species is separable from each of them by the following diagnostic characteristics: 1) Gynoecia terminal on the stems and sometimes with a subfloral innovation; 2) the entire-margined female bracts and bracteoles; 3) the shallowly lobed, wide mouth of perianth and the crenulate lobe-margin; 4) stem-leaves nearly transversely inserted and not decurrent on the stem; 5) stem-apices often nude (without leaves) and gemmiferous; 6) the walls of leaf-cells equally and slightly thickened; 7) the presence of flagella; and 8) the dioicous plant.

SCAPANIACEAE (by Tairoku Amakawa)

Diplophyllum Trollii Grolle in Ergebn. Forsch.-Unt. Nepal Himal. **1**: 273 (1966).

NEPAL. Hile Chok–Ghopte (Tal Pokhari), 3400 m (Jun. 12, 1972); Ghopte–Gosa, 3750 m (Jun. 13, 1972); Saju Pokhari–pass to Topke Gola, 4100–4350 m (Jun. 16, 1972); above Topke Gola, 3610 m (Jun. 18, 1972).

Distr. Nepal.

Scapania bhutanensis Amak. in Fl. E. Himal. **2**: 230, f. 22 (1971).

NEPAL. Lama Chungbu-Slesa, 4250 m (Jun. 24, 1972).

Distr. Nepal and Bhutan.

Scapania ciliata Sande Lac. in Ann. Mus. Bot. Lugd.-Bat. **3**: 209 (1867).

S. Levieri K. Muell.: Fl. E. Himal. 522 (1966).

NEPAL. Dor-Chauke, 2600 m (Jun. 7, 1972).

Distr. E. Himalaya, Bengal, China, Formosa, Korea, and Japan.

Scapania ciliatospinosa Horik. in Journ. Sci. Hiroshima Univ. B, 2, **2**: 222 (1934).

S. ferruginea var. *minor* Amak.: Fl. E. Himal. 521 (1966).

S. Schiffneri Grolle: Fl. E. Himal. **2**: 231 (1971).

NEPAL. Dor-Chauke, 2850 m (Jun. 7, 1972); Suke-Hile Chok, 3600 m (Jun. 11, 1972); Hile Chok-Ghopte, 3400 m (Jun. 12, 1972); Ghopte-Gosa, 3800-4000 m (Jun. 13, 1972); Gosa-Banduke Pokhari, 4050 m (Jun. 14, 1972); Topke Gola-Shewaden, 2950-3400 m (Jun. 28, 1972).

Scapania contorta Mitt.: Fl. E. Himal. 521 (1966).

NEPAL. Around Banduke Pokhari, 4120 m (Jun. 14, 1972).

Scapania ferruguinea (Lehm. et Lindenb.) Lehm. et Lindenb.: Fl. E. Himal. 521 (1966).

NEPAL. Hile-Chitre, 2350 m (Jun. 5, 1972); Ghopte-Gosa, 3850 m (Jun. 13, 1972); Gosa-Banduke Pokhari, 4050 m (Jun. 13, 1972); Banduke Pokhari-Saju Pokhari, 4170 m (Jun. 15, 1972); Topke Gola-Shewaden, 3350 m (Jun. 28, 1972); Shewaden-Papung, 2300-2500 m (Jun. 29, 1972); near Chitre, 2350 m (Jul. 7, 1972).

Scapania Griffithii Schiffn.: Fl. E. Himal. 521 (1966).

NEPAL. Chitre-Basantapur, 2350 m (Jun. 6, 1972).

Distr. Sikkim, Bengal, China (Yunnan, Hunan), and Formosa.

Scapania Harae Amak.: Fl. E. Himal. 522 (1966); **2**: 231 (1971).

NEPAL. Banduke Pokhari-Saju Pokhari, 4220 m (Jun. 15, 1972); Saju Pokhari-pass to Topke Gola, 4300 m (Jun. 16, 1972); Gosainkund-Gopte (Aug. 25, 1972).

Distr. E. Himalaya (Nepal, Sikkim, Bhutan).

Scapania himalayica K. Muell. ex Herz. in Ann. Bryol. **12**: 80 (1939).

NEPAL. Hile Chok-Ghopte, 3500 m (Jun. 12, 1972); Lama Chungbu-Slesa 4250 m (Jun. 24, 1972).

Distr. Nepal and Sikkim.

Scapania Karl-muelleri Grolle in Ergebn. Forsch.-Unt. Nepal Himal. **1**: 270 (1966).

NEPAL. Saju Pokhari-pass to Topke Gola, 4100 m (Jun. 16, 1972).

Distr. Nepal.

Scapania ligulata Steph.: Fl. E. Himal. 522 (1966).

NEPAL. Shewaden-Papung, 2350 m (Jun. 29, 1972).

Distr. Nepal, Sikkim, Formosa, and Japan.

Scapania maxima Horik. in Journ. Sci. Hiroshima Univ. B, 2, **2**: 223 (1934).

S. pseudoferruguinea Amak.: Fl. E. Himal. 523 (1966).

NEPAL. Hile-Chitre, 2350 m (Jun. 5, 1972).

Distr. Nepal, Darjeeling, and Formosa.

Scapania nimbosa Tayl.: Fl. E. Himal. 522 (1966).

NEPAL. Banduke Pokhari-Saju Pokhari, 4150 m (Jun. 15, 1972).

Distr. Scotland, Norway, Nepal, Sikkim, and China (Yunnan).

Scapania orientalis Steph.: Fl. E. Himal. 522 (1966).

NEPAL. Hile Chok-Ghopte, 3400-3500 m (Jun. 12, 1972); Ghopte-Gosa, 3750 m (Jun. 13, 1972); Topke Gola-Shewaden, 3400 m (Jun. 28, 1972).

Scapania ornithopodioides (With.) Pears.: Fl. E. Himal. 522 (1966); **2**: 231 (1971).

NEPAL. Dor-Chauke, 2850 m (Jun. 7, 1972); Suke-Hile Chok, 3570 m (Jun. 11, 1972); Hile Chok-Ghopte, 3400-3500 m (Jun. 12, 1972); Thudam-Kipuphu, 3850 m (Jun. 26, 1972); Topke Gola-Shewaden, 3050-4000 m (Jun. 28, 1972).

Scapania rotundifolia Nichols. in Hand.-Mzt., Symb. Sin. **5**: 31 (1930).

NEPAL. Ghopte-Gosa, 3750 m (Jun. 13, 1972).

Distr. Nepal and Yunnan.

Scapania secunda Steph. in Mem. Soc. Nat. Cherbourg **29**: 220 (1894).

NEPAL. Ghopte-Gosa, 3700 m (Jun. 13, 1972).

Distr. Himalaya and Yunnan.

Scapania Stephanii K. Muell. in Nova Act. Acad. Caes. Leop.-Carol. **83**: 273 (1905).

NEPAL. Dor-Chauke, 2850 m (Jun. 7, 1972); Topke Gola-Shewaden, 2850 m (Jun. 28, 1972).

Distr. Nepal and Japan.

DELAVAYELLACEAE (by Sinske Hattori)

Delavayella serrata Steph.: Fl. E. Himal. 513 (1966); **2**: 228 (1971).

D. serrata f. *stolonifera* Hatt. in Fl. E. Himal. 513 (1966).

D. serrata var. *purpurea* Chen in Fedde, Repert. **58**: 38, f. 10 (1955).

NEPAL. Basantapur-Dor, 2550 m, on tree trunk (Jun. 6, 1972); Dor, 2300 m, on tree trunk (Jun. 6, 1972); Dor-Chauke, 2850 m, on tree trunk and branches (Jun. 7, 1972); forest below Lamo Pokhari, 2630 m (Jun. 9, 1972).

GYMNOMITRIACEAE (by Naofumi Kitagawa)

Gymnomitrion laceratum (Steph.) Horik. in Act. Phytotax. Geobot. **13**: 212 (1943).

NEPAL. Ghopte-Gosa, 3850 m, 4020 m, on rock (Jun. 13, 1972); around Banduke Pokhari, 4120 m, in rock crevices (Jun. 14, 1972); in a coniferous forest above Topke Gola, 3610 m, on rock (Jun. 18, 1972); around Kipuphu, 4500 m, 4550 m, on rocky cliff, soil (Jun. 26, 1972).

Distr. Africa, Nepal, Borneo (Mt. Kinabalu-var. *borneense*), Japan, N. America (Appalachians), Mexico, and Peru.

This species belonging to subgen. Archigymnomitrion is very remarkable for its primitive characters as well as for its extraordinarily disjunctive distribution. The range of this relic species is now again disjunctively extended to the Himalayan region. The species seems to be rather common at the high altitudes in Nepal, where the plants grow vigorously bearing mature sporophytes and exhibit a con-

siderable range of variation.

Gymnomitrion obtusilobum N. Kitag., sp. nov. [Fig. 29]

Planta monoica (paroica), mediocris, ex fumoso rufo-brunnea, dense caespitosa. Folia conferta, erecte appressa, concava, late ovata, subsymmetrica, 400–550 μ longa, 370–550 μ lata, minus quam 1/3-biloba, lobis late ovatis, obtusis, sinu acutissimo. Cellulae apicales et marginales hyalinae, parietibus aequaliter valde incrassatis, subapicales 15.0–20.0 μ, medianae 20.0–32.0 $\times$ 15.0–20.5 μ, basales 22.5–30.5 $\times$ 13.5–21.5 μ (omnino mensae per lumine), parietibus aliquantum tenuibus et trigonis acutis, cuticula fere laevi. Androecium hypogynum, bracteis 1-2-jugis, confertis, monandris. Gynoecium (cum androecio) compresso-clavatum, tumori ventrali evoluto. Folia floralia multo majora, erecta, cetera foliis caulinis similia (sed intima minora, irregulariter pluriloba, postice coalita). Perianthia nulla. Capsula sphaerica, valvulis bistratosis. Sporae rufo-brunneae, 13.5–18.0 μ, asperae.

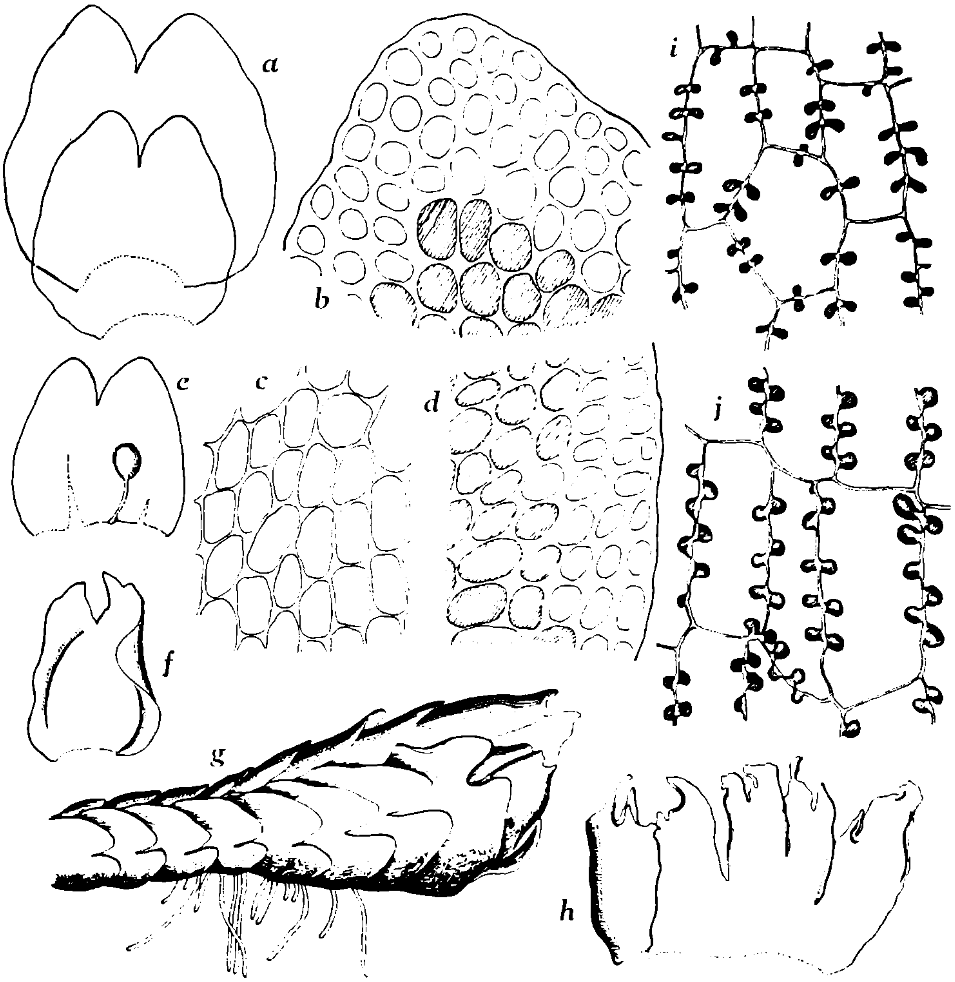

Fig. 29. *Gymnomitrion obtusilobum* N. Kitag. a. Leaves, ×50, b. Cells of leaf-apex, ×300, c. Cells of leaf-middle, ×300, d. Cells of leaf-margin, ×300, e. Male bract with an antheridium, ×30, f. Outer female bract, ×30, g. Part of fertile plant, ×30, h. Innermost female bracts, ×50, i. Cells of inner layer of capsule-wall, ×450, j. Cells of outer layer of capsule-wall, ×450. All drawn from the type.

Elateres bispiri, 8.5–10.0 μ lati.

NEPAL. Around Phujeng La, 4750 m, in crevices of rock (Jun. 27, 1972–type in NICH 312677).

Distr. Endemic to Nepal.

This species is well characterized by the following unusual features; the plant is paroicous (this sexuality is not known in any other boreal species of *Gymnomitrion*), and the stem-tissue in the inflorescence is somewhat fleshy and a ventral swelling is weakly developed there (thus the inflorescence forms a blunt angle with the stem-axis. The present species somewhat resembles *G. obtusum* but they can be distinguished even in sterile plants. *G. obtusum* differs from *G. obtusilobum*, aside from the reproductive characters mentioned above, in the comparatively thin-walled cells in the apical and marginal portion of leaves, the distinctly crenulate lobes of leaves, and the minutely verruculose cuticle of leaf-cells. The apical and marginal hyaline cells of leaves whose walls are strongly and evenly thickened recall *G. laceratum*, which is separated from *G. obtusilobum* in the acute lobes and deeper (more than 1/3) sinuses of leaves, the small underleaves occurring sporadically, and the

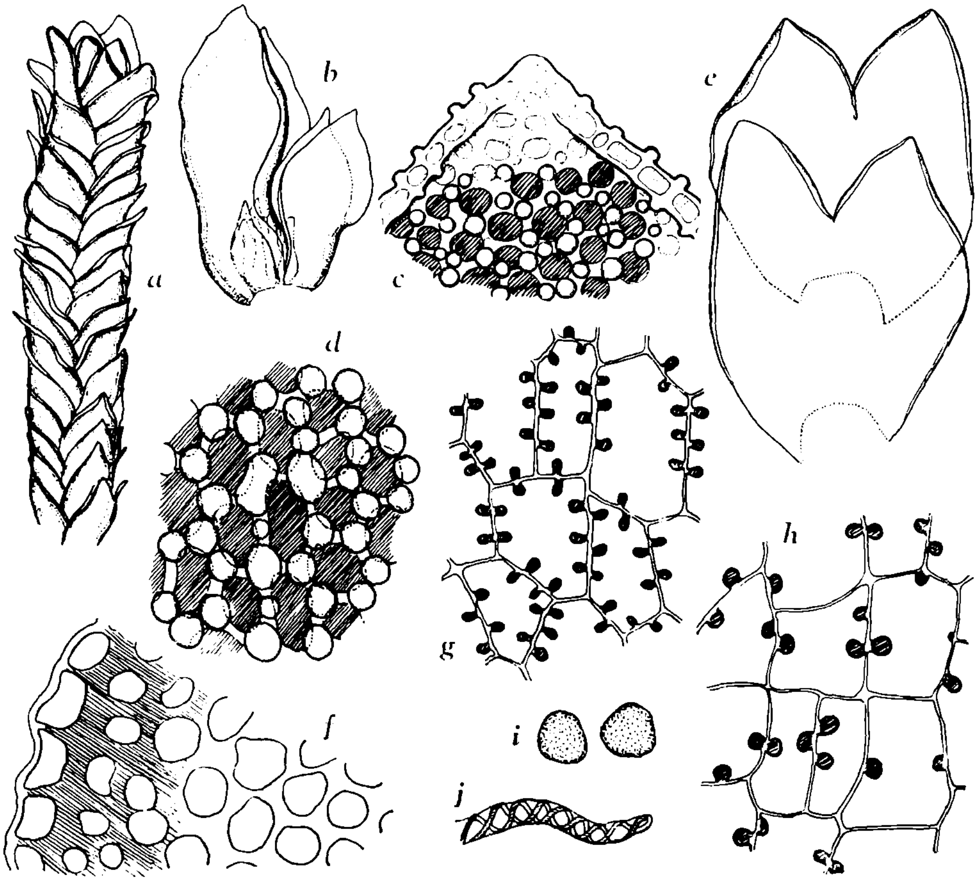

Fig. 30. *Gymnomitrion papillosum* N. Kitag. et Hatt. a. Part of female plant, ×20, b. Female bracts with archegonia inside, ×50, c. Cells of leaf-apex, ×450, d. Cells of leaf-middle, ×450, e. Leaves, ×50, f. Part of stem cross-section, ×450, g. Cells of inner layer of capsule-wall, ×450, h. Cells of outer layer of capsule-wall, ×450, i. Spores, ×450, j. Part of elater, ×450. All drawn from the type.

lacerate-ciliate, inner female bracts.

Gymnomitrion papillosum N. Kitag. et Hatt., sp. nov. [Fig. 30]

Planta dioica, major, lurida, dense caespitosa. Folia conferta, erecti-appressa, concava, late ovata, subsymmetrica, 600–750 μ longa, 570–750 μ lata, ad 1/3 biloba, lobis late ovato-triangulatis, subacutis vel obtusiusculis, sinu acutissimo, margine arcte angusteque recurvis. Cellulae apicales hyalinae et saepe erosae, subapicales 7.5–11.5 μ, medianae 12.5–23.5×8.5–11.0 μ, basales 12–35×9.0–12.5 μ (omnino mensae per lumine), parietibus valde crassis, trigonis magnis sed indistinctis; cuticula dense papillosa, papillis magnis, plerumque trigonis insidentibus. Folia floralia multo majora (sed intima minora), cetera foliis caulinis similia, ad basin soluta. Perianthia nulla. Capsula sphaerica, valvulis bistratosis. Sporae rufo-brunneae, 12–15 μ, asperae. Elateres bispiri, 6.5–7.5 μ lati.

NEPAL. Ghopte–Gosa, 4020 m, on rock (Jun. 13, 1972); Gosa–Banduke Pokhari, in crevices of rock, 4210 m (Jun. 14, 1972–type in NICH 311992); Saju Pokhari-pass to Topke Gola, 4350 m, on rock (Jun. 16, 1972); around Kipuphu, 4550 m, on rock (Jun. 26, 1972); Ramche–Gram, 1800–1900 m (Aug. 20, 1972).

Distr. Endemic to Nepal.

This species is best characterized by the densely papillate cuticle of leaf-cells. The papillae are very large (mostly 6.5–9.5 μ in diameter at leaf-middle) and situated mostly on trigones of leaf-cells (at leaf-base, they are often elongated along cell-walls and confluent with adjacent ones). This species somewhat resembles *Marsupella revoluta*, but differs from it in the dark brown (not blackish) plants, the very closely imbricate and tightly appressed leaves, and the characteristically papillate cuticle of leaf-cells.

Gymnomitrion sinense K. Muell. in Rev. Bryol. Lichénol. **20**: 176 (1951).

NEPAL. Janga La–Thudam, 4550 m, on rock (Jun. 21, 1972); around Kipuphu, 4550 m, on rock (Jun. 26, 1972); around Phujeng La, 4500 m, 4650 m, 4750 m, on rock or soil (Jun. 27, 1972).

Distr. Nepal and China (Yunnan).

Marsupella alpina (Gott.) Bernet, Cat. Hepat. Suisse 29 (1888).

NEPAL. Around Banduke Pokhari, 4120 m, on rock (Jun. 14, 1972).

Distr. Europe, Himalaya (E. Napal), Japan, and N. America (Pacific coast of Alaska and Canada). New to Himalaya.

Marsupella crystallocaulon Grolle in Ergebn. Forsch.-Unt. Nepal Himal. **1** (4): 281 (1966).

NEPAL. Suke–Hile Chok, 3000 m, on bank (Jun. 11, 1972).

Distr. Endemic to Nepal.

Marsupella emarginata (Ehrh.) Dum., Comm. Bot. 114 (1822).

NEPAL. Ghopte–Gosa, 4000 m, on rock (Jun. 13, 1972); Janga La–Thudam, 4600 m, on rock (Jun. 21, 1972).

Distr. Europe, Nepal, Borneo (Mt. Kinabalu), Formosa, Korea, Japan, Saghalien, and N. America (plants of E. Asia belonging to subsp. *tubulosa*). New to Himalaya.

Marsupella integra Kitag. in Journ. Hattori Bot. Lab. **30**: 199 (1967).

NEPAL. Gosa–Banduke Pokhari, 4050 m, on humus (Jun. 14, 1972); around Banduke Pokhari, 4120 m, in rock-crevices (Jun. 14, 1972).

Distr. Nepal, New Guinea (Mt. Wilhelm), and Borneo (Mt. Kinabalu).

This species is previously known only from a few localities at high altitudes of New Guinea and North Borneo. It is a highly distinctive species assigned to subgen. Neomarsupella N. Kitag.

Marsupella revoluta (Nees) Dum.: Fl. E. Himal. 523 (1966).

NEPAL. Hile Chok-Gopte, 3350 m, 3500 m, on rock (Jun. 12, 1972); Gopte-Gosa, 3700 m, 3750 m, 3850 m, 3970 m, 4020 m, on rock, soil (Jun. 13, 1972); around Banduke Pokhari, 4120 m, in rock-crevices (Jun. 14, 1972); Banduke Pokhari-Saju Pokhari, 4150 m, 4170 m, on rock (Jun. 15, 1972); Saju Pokhari-pass to Topke Gola, 4100 m, 4150 m, 4350 m, on rock (Jun. 16, 1972); Jalang Chhyongo-Janga La, 4600 m, on soil (Jun. 21, 1972); around Kipuphu, 4450 m, 4500 m, 4550 m, on soil, rock (Jun. 26, 1972); around Phujeng La, 4750 m, on rock (Jun. 27, 1972); Kipuphu-Phujeng La, 4600 m, 4650 m, on soil (Jun. 27, 1972); Ramche-Gram, 1800–1900 m (Aug. 20, 1972); Gosainkund-Surjakund, 4200–4400 m (Aug. 25, 1972); Thale Patil-Hile Dhap, 3400 m (Aug. 27, 1972).

Distr. Greenland, Europe, Himalaya, Borneo (Mt. Kinabalu), Philippines (Mt. Pulog), China (Yunnan), Formosa, and Japan.

Marsupella rubida (Mitt.) Grolle in Ergebn. Forsch.-Unt. Nepal Himal. **1** (4): 182 (1966).

NEPAL. Hile Chok-Ghopte, 3400 m, on rock (Jun. 12, 1972); Ghopte-Gosa, 3750 m, 3850 m, on rock (Jun. 13, 1972); in a forest below Thudam, 4350 m, on rock (Jun. 25, 1972).

Distr. Himalaya and Formosa.

RADULACEAE (by Kohsaku Yamada)

Radula auriculata Steph. in Bull. Herb. Boiss. **5**: 105 (1897).

NEPAL. Thudam, 3250 m, on rock (Jun. 25, 1972).

Distr. E. Nepal, Korea, Japan, and North America. New to Himalaya.

Radula madagascariensis Gott. in Abhandl. naturwis. Verein Bremen, **7**: 349 (1882).

NEPAL. Basantapur-Dor, 2300–2600 m, on tree trunk (Jun. 6, 1972).

Distr. Madagascar, Mascaren Isl, and E. Nepal. New to Himalaya.

Radula obscura Mitt. in Proc. Linn. Soc. **5**: 107 (1861).

NEPAL. Sanguri Bhanjyang, 1200–1300 m, on rock (Jun. 2, 1972); Papung-Bir Gaon, 2000–1600 m, on rock (Jun. 30, 1972).

Distr. E. Nepal, India, China, Borneo, and Philippines. New to Himalaya.

Radula tjibodensis Goebel: Fl. E. Himal. 524 (1966).

NEPAL. Dor-Chauke, 2600–2900 m, on tree branch and leaves (Jun. 7, 1972).

Distr. E. Nepal, Sikkim, Java, Borneo, Philippines, New Guinea, and Samoa.

PORELLACEAE (by Sinske Hattori)

Porella caespitans (Steph.) Hatt. var. **setigera** (Steph.) Hatt. in Journ. Hattori Bot. Lab. **33**: 53, f. 9–10 (1970).

NEPAL. Basantapur-Dor, 2350 m, on tree trunk (Jun. 6, 1972).

Distr. Var. *caespitans*: China (Yunnan); var. *setigera*: India, Nepal, China, Korea, and Japan.

Porella campylophylla (L. & L.) Trev.: Hatt. in Fl. E. Himal. 524 (1966); in Journ. Hattori Bot. Lab. **32**: 331, f. 10, 11, 13 (1969).

NEPAL. Near Sanguri Bhanjyang, 1260 m, on tree trunk (Jun. 2, 1972); Hile-Chitre, 2150 m, on rock (Jun. 5, 1972); Dor-Chauke, 2750 m, on rocky cliff (Jun. 7, 1972); Chauke-Lamo Pokhari, 2620-2680 m, on rock and bank (Jun. 8, 1972); mossy forest below Lamo Pokhari, 2630 m, on soil (Jun. 9, 1972); Suke-Hile Chok, 2980 m, on humus (Jun. 11, 1972); forest below Thudam, 3250 m, on rock (Jun. 25, 1972); Papung-Bir Gaon, 1800 m, on tree trunks (Jun. 30, 1972); Bir Gaon-Dingla, 1100-1350 m, on rock and tree trunk (Jul. 1, 1972); Dingla-Doban, 950-1000 m, on tree trunks (Jul. 2, 1972); Nessum-Bhuje, 1050 m, on tree trunk (Jul. 3, 1972).

Distr. India, Nepal, Sikkim, and Bhutan.

Porella nitens (Steph.) Hatt.: Fl. E. Himal. 525 (1966); **2**: 232 (1971)-Hatt. in Journ. Hattori Bot. Lab. **30**: 141, f. 8 (1967).

NEPAL. Phulchoki, summit area, 2400 m, on rock (Jul. 15, 1972).

Porella plumosa (Mitt.) Inoue in Bull. Nat. Sci. Mus. Tokyo **9** (3): 385 (1966)-Hatt., l.c. **30**: 144, f. 9 (1967); **33**: 82 (1970).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on tree trunk (Jun. 2, 1972); Phulchoki, summit area, 2400 m, on rock (Jul. 15, 1972).

Distr. Himalaya, Khasia Hills, Burma, Vietnam, Formosa, and the Philippines (Luzon).

FRULLANIACEAE (by Sinske Hattori)

Frullania Berthoumieui Steph. in Hedwigia **33**: 140 (1894).

NEPAL. Bir Gaon-Dingla, 1910 m, on tree trunk (Jul. 1, 1972).

Distr. Himalaya, Burma, Thailand, and the Philippines.

Previously this species has been known in Burma; detailed locality of the type collection is not given. I found, however, this species in many collections made in Thailand and the Philippines, as well as Himalayan region.

Frullania Delavayi Steph.: Fl. E. Himal. 525 (1966); **2**: 234 (1971).

NEPAL. Chauke-Lamo Pokhari, 2680 m, on branches (Jun. 8, 1972); Suke-Hile Chok, 3500 m, on branches (Jun. 11, 1972); Topke Gola, 3600 m, on fire wood (Jun. 17, 1972); coniferous forest above Topke Gola, 3610 m, on fallen branches and on trunks of trees (Jun. 18, 1972); *Rhododendron* forest above Topke Gola, 3650 m, on tree trunks (Jun. 18, 1972); slope above Jalang Chhyongo, 4400 m, in crevices of cliff (Jun. 21, 1972); forest below Thudam, 3250 m, on branches (Jun. 25, 1972); Topke Gola-Shewaden, 3400 m, on branches (Jun. 28, 1972).

Frullania Duthiana Steph.: Fl. E. Himal. 525 (1966)-Hatt. in Journ. Hattori Bot. Lab. **37**: 92, f. 49 (1973).

F. Duthiana Steph. var. *appendiculata* Hatt. in Fl. E. Himal. **2**: 234, f. 24 (1971)-Hatt., l.c. **37**: 94, f. 50 (1973).

NEPAL. Mossy forest below Lamo Pokhari, 2850 m, on fallen branches (Jun. 9, 1972); Suke, 2900 m, on branches (Jun. 10, 1972); coniferous forest above Topke Gola, 3600-3650 m, on tree trunks (Jun. 18, 1972); forest below Thudam, 3420 m, on branches (Jun. 22, 1972).

var. **laevis** Hatt., var. nov.

A typo recedit perianthio carinis 3 altis laevibus praedito, foliorum lobis anguste incurvatis, amphigastrii marginibus lateralibus angustissime recurvatis.

NEPAL. Dor–Chauke, 2850 m, on tree trunks (Jun. 7, 1972); Chauke–Lamo Pokhari, 2580 m, on tree trunk (Jun. 8, 1972); mossy forest below Lamo Pokhari, 2700-2850 m, on fallen branches (Jun. 9, 1972, coll. Z. Iwatsuki 595–holotype in NICH, dupl. in TI); Suke, 2900 m, on fallen branches (Jun. 10, 1972); Suke–Hile Choke, 2970 m, on branches (Jun. 11, 1972); forest below Thudam, 3420 m, on branches (Jun. 22, 1972).

Distr. sp. India, Nepal, Sikkim, and Bhutan.

Frullania ericoides (Nees) Mont.: Fl. E. Himal. **2**: 236 (1971).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on rock (Jun. 2, 1972); Dhara Pani–Mohamabedi Khola, 950 m, on tree trunks (Jun. 3, 1972); Teku Nala–Dhankuta, 1250–1970 m, on tree trunks and roots (Jun. 4, 1972); Dhankuta–Nigale, 1550 m, on tree trunks (Jun. 4, 1972); Nigale–Kuwa Pani, 1720 m (Jun. 4, 1972); Kuwa Pani–Hile, 1860 m, on rock (Jun. 4, 1972); Hile–Chitre, 1950–2150 m, on tree trunks and rock (Jun. 5, 1972); Papung–Bir Gaon, 1900 m, on stone wall (Jun. 30, 1972); Bir Gaon–Dingla, 1350–1610 m, on rock and trees (Jul. 1, 1972); Nessum–Bhuje, 1600 m, on tree trunks (Jul. 3, 1972); around Sanguri Banjyang, 1150 m, on rock (Jul. 10, 1972); Phulchoki, 1650 m, on tree trunks (Jul. 15, 1972).

The present species is a highly plastic taxon, previously called as *F. squarrosa*, and is accompanied by a number of synonyms.

Frullania muscicola Steph.: Fl. E. Himal. 526 (1966).

NEPAL. Dhankuta–Nigale, 1550 m, on tree trunks (Jun. 4, 1972); Suke–Hile Chok, 3600 m, on branches (Jun. 11, 1972); Bir Gaon–Dingla, 1300 m, on tree trunks (Jul. 1, 1972); Nessum–Bhuje, 1050 m, on tree trunks (Jul. 3, 1972).

The present species is a very variable taxon, closely related to European *F. dilatata* and North American *F. Brittoniae.*

Frullania nepalensis (Spreng.) Lehm. et Lindenb.: Fl. E. Himal. 526 (1966)–Hatt., in Journ. Hattori Bot. Lab. **37**: 131, f. 73–77 (1973).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on rock (Jun. 2, 1972); Hile–Chitre, 2150 m, on rock (Jun. 5, 1972); Chitre–Basantapur, 2350 m, on soil and tree trunks (Jun. 6, 1972); Basantapur–Dor, 2370 m, on rock and tree trunks (Jun. 6, 1972); Dor–Chauke, 2600–2850 m, on tree trunks and bush (Jun. 7, 1972); Chauke–Lamo Pokhari, 2580–2680 m, on tree trunks, banks, and on humus (Jun. 8, 1972); mossy forest below Lamo Pokhari, 2700 m, on decaying branches (Jun. 9, 1972); Lamo Pokhari–Gupha Pokhari, 2830 m, on bank (Jun. 10, 1972); Suke, 2900 m, on tree trunks (Jun. 10, 1972); forest below Thudam, 3250 m, on tree trunks (Jun. 25, 1972); Shewaden–Papung, 2200 m, on rotten log (Jun. 29, 1972); Gupha Pokhari–Chauke, 2600 m, on branches (Jul. 4, 1972); Chauke–Dor, 2600 m, on branches (Jul. 6, 1972); forest near Chitre, 2350 m, on branches (Jul. 7, 1972); and many others.

Distr. Widely distributed in temperate to tropic regions of Asia, northward to Japan and Korea, southward to New Guinea; most common in Himalaya and as epiphytes in mossy forests in northern Luzon, the Philippines, whereas rather rare in other areas.

Frullania neurota Tayl.: Fl. E. Himal. 526 (1966); **2**: 237 (1971)–Hatt. in Journ. Hattori Bot. Lab. **36**: 133, f. 19 a–h (1972).

F. Hieronymi Steph. ex Bonner, Index Hepat. **5**: 326 (1965), sine descr.

F. neurota var. *Pfleiderei* Hatt., l.c. **36**: 133, f. 18 (1972).

NEPAL. Basantapur–Dor, 2370 m, on branches (Jun. 6, 1972); forest near Chitre, 2350 m, on branches (Jul. 7, 1972).

Frullania pallide-virens Steph., Sp. Hepat. **4**: 454 (1911)–Hatt. in Journ. Hattori Bot. Lab. **37**: 101, f. 55 (1973).

NEPAL. Shewaden–Papung, 2200 m, on rotten log (Jun. 29, 1972); near a waterfall below Chitre, 2250 m, on rock (Jul. 8, 1972).

Distr. Himalaya and China (Kong Tcheou and N.W. Yunnan).

This species was previously known from the type collected in Pin-fo, Prov. Kong Tcheou, and a collection made in Maliwan, northeastern Yunnan, China. The plant in the type collection is pallid greenish in herbaria (the specific epithet was thus derived), whereas the plants in the above-cited two collections are reddish to dark brown (shoot apices are often pallid greenish). The pale color of the plant in the type is considered as caused by shaded habitat conditions.

Frullania physantha Mitt.: Fl. E. Himal. 527 (1966); **2**: 237 (1971).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on rock (Jun. 2, 1972); Hile–Chitre, 1950 m, on tree trunks (Jun. 5, 1972).

The very large perianths of this species are very remarkable, by which we can easily recognize this species in the field.

Frullania retusa Mitt.: Fl. E. Himal. 527 (1966); **2**: 237 (1971)–Hatt. in Journ. Hattori Bot. Lab. **37**: 96–97, f. 51 (1973).

NEPAL. Near Sanguri Bhanjyang, 1270 m, on rock (Jun. 2, 1972); mossy forest below Lamo Pokhari, 2650 m, on fallen branches (Jun. 9, 1972); Nessum–Bhuje, 1800 m, on rock (Jul. 3, 1972); near a waterfall below Chitre, 2250 m, on rock (Jul. 8, 1972).

Distr. India, Nepal, Sikkim, Bhutan, and E. Tibet.

Frullania subclavata Steph., Sp. Hepat. **4**: 354 (1910). [Fig. 31]

Plants reddish-brown in herbaria, small to medium-sized; stem 2–3 cm long, irregularly pinnately branched, branches more or less remote and obliquely spreading, short (2–5 mm) but occasionally long and similar to the stem. Lobes of stem-leaves slightly distant, dorsally extending more than stem-width beyond the

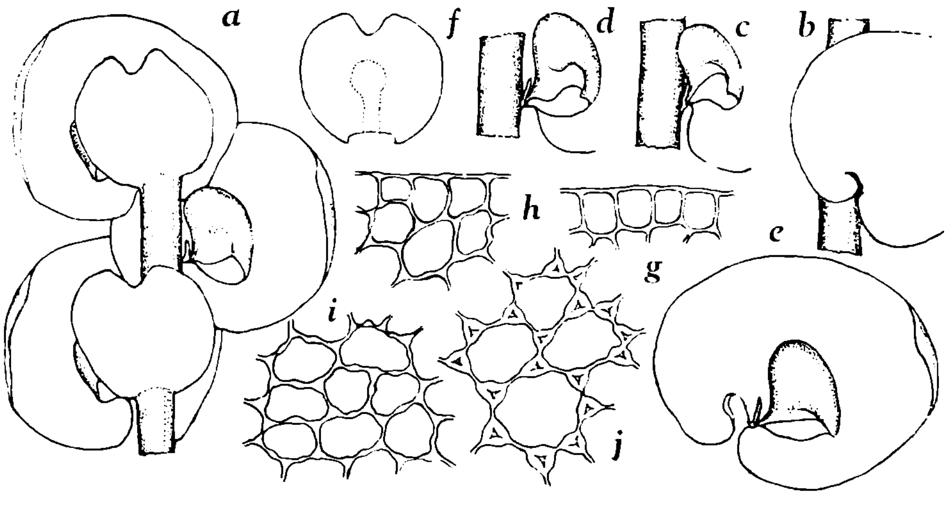

Fig. 31. *Frullania subclavata* Steph. a. Portion of stem, ventral view, ×30, b. Basal portion of leaf-lobe, showing the insertion on stem, dorsal view, ×30, c, d. Leaf-lobules and styli on stems, ×30, e. Stem-leaf, appressed, ×30, f. Stem-underleaf, appressed, ×30, g–j. Cells of lobes of stem-leaves, g, h from margins, i from middle, j from base, all ×330. Drawn from type in G (1972).

farther edge of stem, concave with incurved apical margin, when flat ovate, 0.85–1 mm long and 0.85–0.9 mm wide, with rounded to obtuse apex, both dorsal and ventral bases strongly rounded-appendiculate; cell-cavities 10–16×10–12 μ along margin, 17–20×11–16 μ at middle, 22–30×18–27 μ at base, cell-walls thin and substraight with small or indistinct trigones and intermediate thickenings at middle, with large and nodulose trigones at base; leaf-lobules contiguous to the stem, cucullate, mouth wide with arched inner margin and straight outer margin, beak poorly developed with short, subtruncate tip, styli small, filiform, of several uniseriate cells. Underleaves of stem flat and almost appressed, nearly orbicular in outline, ca. 0.48 mm long and 0.55 mm wide, 1/4–1/3-bifid, sinus wide and subacute, lobes wide and subtriangular with obtuse to subacute apex, rhizoid-initial at the center of underleaf, insertion nearly transverse. Dioicous? (gynoecia not seen). Androecia capitate, comparatively small, shortly stalked, capitate with 2–3 bracts.

NEPAL. Dhankuta–Nigale, 1550 m, on tree trunks (Jun. 4, 1972); Bir Gaon–Dingla, 1610 m, on rock (Jul. 1, 1972).

Distr. E. Himalaya.

From the above description and Fig. 31 (based on the type collection made in Darjeeling, India, by Wichura in 1852, in herb. G no. 7972) the present species seems to be closely related to, and may possibly be conspecific with, *F. muscicola* Steph. Previously the present species has been known only from the type collection made in Darjeeling. The collection made between Bir Gaon and Dingla (coll. Z. Iwatsuki 2139) is a form somewhat different from the type in the shape of leaf-lobules and some other features.

Frullania Wallichiana Mitt.: Fl. E. Himal. 528 (1966)–Hatt. in Journ. Hattori Bot. Lab. **36**: 135 (1972).

NEPAL. Dhankuta–Nigale, 1550 m, on tree trunks (Jun. 4, 1972); Kuwa Pani–Hile, 1890 m, on bush (Jun. 4, 1972); Hile–Chitre, 2150 m, on rock (Jun. 5, 1972); Basantapur–Dor, 2370 m, on branches (Jun. 6, 1972); Dor–Chauke, 2580–2850 m, on tree-branches, -trunks, and on bush (Jun. 7, 1972); Chauke–Dor, 2600 m, on branches (Jul. 6, 1972); Dor–Chitre, 2350 m, on branches (Jul. 7, 1972); forest near Chitre, 2350 m, on branches (Jul. 7, 1972).

Distr. Widely distributed in tropical Africa, Asia, and? C. to S. America.

Frullania yunnanensis Steph.: Fl. E. Himal. 528 (1966); **2**: 238 (1971).

F. Horikawana Verd. in Hand.-Mzt., Symb. Sin. **5**: 36, f. 14 (1930).

NEPAL. mossy forest below Lamo Pokhari, 2850 m, on fallen branches (Jun. 10, 1972); coniferous forest above Topke Gola, 3610 m (Jun. 18, 1972); forest below Thudam, 3250 m, on fallen branches (Jun. 25, 1972); Topke Gola–Shewaden, 2650–3200 m, on branches (Jun. 28, 1972).

LEJEUNEACEAE (by Masami Mizutani)

Cheilolejeunea imbricata (Nees) Hatt.: Fl. E. Himal. 529 (1966).

NEPAL. Chitre–Basantapur, 2350 m, on tree-trunks (Jun. 6, 1972); Topke Gola–Shewaden, 2650 m, on branches (Jun. 28, 1972).

Cheilolejeunea subopaca (Mitt.) Mizt.: Fl. E. Himal. 529 (1966); **2**: 239 (1971).

NEPAL. Near Chitre, 2350 m, on branches (Jul. 7, 1972).

Cololejeunea lanciloba Steph. in Hedwigia **34**: 250 (1895).

NEPAL. Dharan, 200–240 m, on tree-trunks (Jun. 1, 1972); Dhankuta-Nigale, 1550 m, on tree-trunks (Jun. 4, 1972); Dor–Chauke, 2550 m, on branches of fallen tree (Jun. 7, 1972); Bir Gaon–Dingla, 1100 m, on tree-trunks (Jul. 1, 1972); Gupha Pokhari–Chauke, 2600 m, on branches (Jul. 4, 1972).

Distr. Nepal, S. India, Nicobar, Borneo, S. China, and S. Japan.

Cololejeunea minutissima (Smith) Schiffn.: Fl. E. Himal. 533 (1966).

NEPAL. Chauke–Lamo Pokhari, 2680–2850 m, on branches (Jun. 8, 1972); Dor, 2300 m, on branches (Jul. 6, 1972).

Cololejeunea spinosa (Horik.) Hatt.: Fl. E. Himal. 533 (1966).

NEPAL. Dor–Chauke, 2620 m, on leaves (Jun. 7, 1972).

Colura tenuicornis (Evans) Steph., Sp. Hepat. **5**: 942 (1916).

NEPAL. Suke, 2900 m, on branches (Jun. 10, 1972).

Distr. Madagascar, Nepal, Malay, Sumatra, Java, Borneo, S. China, Formosa, Japan, Hawaii, and S. America. New record of the genus for Himalaya.

Dicranolejeunea javanica Steph.: Fl. E. Himal. 530 (1966).

NEPAL. Near Chitre, 2350 m, on branches (Jul. 7, 1972).

Drepanolejeunea angustifolia (Mitt.) Grolle: Fl. E. Himal. 530 (1966).

NEPAL. Basantapur–Dor, 2550 m, on tree-trunks (Jun. 6, 1972); Chauke–Lamo Pokhari, 2680 m, on branches (Jun. 8, 1972); below Lamo Pokhari, 2630 m, on tree-trunks (Jun. 9, 1972); Dor, 2300 m, on branches (Jul. 6, 1972).

Drepanolejeunea monophthalma (Herz.) Mizt.: Fl. E. Himal. 530 (1966).

NEPAL. Basantapur–Dor, 2550 m, on branches (Jun. 6, 1972); Dor–Chauke, 2850 m, on branches (Jun. 7, 1972); Chauke–Lamo Pokhari, 2850 m, on branches (Jun. 8, 1972); Nessum–Bhuje, 1850 m, on rocks (Jul. 3, 1972); Gupha Pokhari–Chauke, 2600 m, on decaying branches (Jul. 4, 1972); near Chitre, 2350 m, on branches (Jul. 7, 1972).

Lejeunea bidentula Herz.: Fl. E. Himal. 530 (1966).

NEPAL. Suke, 2900 m, on branches (Jun. 10, 1972); Gupha Pokhari-Chauke, 2600 m, on branches (Jul. 4, 1972).

Distr. N.W. India (Mussoorie), Nepal, and W. China (Yunnan).

Lejeunea cavifolia (Ehrh.) Lindb. in Act. Soc. Sci. Fenn. **10**: 43 (1871).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on tree-trunks (Jun. 2, 1972); Papung-Bir Gaon, 1850 m, on rocks (Jun. 30, 1972).

Distr. Europe, Caucasus, N.W. India (Mussoorie), Nepal, Sikkim, Assam, Siberia, and N. America.

Lejeunea flava (Sw.) Nees: Fl. E. Himal. **2**: 239 (1971).

NEPAL. Basantapur–Dor, 2350–2550 m, on branches (Jun. 6, 1972); Chauke–Lamo Pokhari, 2680–2850 m, on branches (Jun. 8, 1972); below Lamo Pokhari, 2650–2850 m, on branches (Jun. 9, 1972); Shewaden–Papung, 2350 m, on leaves (Jun. 29, 1972); Gupha Pokhari–Chauke, 2600 m, on decaying branches (Jul. 4, 1972); Chauke–Dor, 2300–2600 m, on branches (Jul. 6, 1972); Chitre, 2350 m, on branches (Jul. 7, 1972).

Lejeunea nepalensis Steph., Sp. Hepat. **5**: 780 (1915).

NEPAL. Chauke–Dor, 2600 m, on branches (Jul. 6, 1972); Phulchoki, 2400 m, on rocks (Jul. 15, 1972).

Distr. N.W. India (Mussoorie), Nepal, Sikkim, and Assam.

Lejeunea obfusca Mitt. in Journ. Linn. Soc. Bot. **5**: 114 (1861).

NEPAL. Below Lamo Pokhari, 2630 m, on branches (Jun. 9, 1972); near Chitre, 2350 m, on branches (Jul. 7, 1972).

Distr. India, Nepal, and Ceylon. New to Nepal.

Lejeunea princeps (Steph.) Mizt. in Journ. Hattori Bot. Lab. **34**: 454 (1971).

NEPAL. Hile–Chitre, 2150 m, on rocks (Jun. 5, 1972); Basantapur–Dor, 2510 m, on rotten logs (Jun. 6, 1972).

Distr. Nepal, Sikkim, and Assam.

Lejeunea tuberculosa Steph., Sp. Hepat. **5**: 790 (1915).

NEPAL. Sanguri Bhanjyang, 1250 m, on tree-trunks (Jul. 10, 1972).

Distr. N.W. India, Nepal, Sikkim, and Assam. New to Nepal.

Lejeunea ulicina (Tayl.) Tayl. in Gott. et al., Synop. Hepat. 387 (1845).

NEPAL. Basantapur–Dor, 2550 m, on branches (Jun. 6, 1972); Chauke–Lamo Pokhari, 2680 m, on branches (Jun. 8, 1972); below Lamo Pokhari, 2850 m, on branches (Jun. 9, 1972); Dor, 2300 m, on branches (Jul. 6, 1972); near Chitre, 2350 m, on branches (Jul. 7, 1972).

Distr. Europe, Himalaya, E. Asia, and N. America.

Lejeunea Wallichiana Lehm., Pugillus **3**: 5 (1831).

NEPAL. Basantapur–Dor, 2350–2370 m, on branches (Jun. 6, 1972); Dor–Chauke, 2550–2850 m, on branches (Jun. 7, 1972); Chauke–Lamo Pokhari, 2680 m, on branches (Jun. 8, 1972); below Lamo Pokhari, 2700–2850 m, on branches (Jun. 9, 1972); Suke, 2900 m, on branches (Jun. 10, 1972); Suke–Hile Chok, 2970 m, on branches (Jun. 11, 1972); Gupha Pokhari–Chauke, 2600 m, on branches (Jul. 4, 1972); Chauke–Dor, 2600 m, on branches (Jul. 6, 1972).

Distr. Nepal and Sikkim.

Leptolejeunea elliptica (Lehm. & Lindenb.) Schiffn. in Engl. et Prantl, Nat. Pfl.-fam. I, **3**: 126 (1895).

NEPAL. Shewaden–Papung, 2500 m, on leaves (Jun. 29, 1972).

Distr. Widely distributed in tropical and subtropical regions in Asia.

Leucolejeunea turgida (Mitt.) Verd. in Ann. Bryol. Suppl. **4**: 71 (1934).

NEPAL. Dor–Chauke, 2850 m, on tree-trunks (Jun. 7, 1972); below Lamo Pokhari, 2630–2700 m, on trunks and branches of trees (Jun. 9, 1972); Suke–Hile Chok, 3200 m, on tree-trunks (Jun. 11, 1972); near Chitre, 2350 m, on tree-trunks (Jul. 7, 1972).

Distr. Nepal, Sikkim, and Thailand. New to Nepal.

Lopholejeunea subfusca (Nees) Steph.: Fl. E. Himal. 531 (1966).

NEPAL. Papung–Bir Gaon, 1800 m, on tree-trunks (Jun. 30, 1972); Dingla, 1550 m, on rocks (Jul. 1, 1972); Sanguri Banjyang, 1250 m, on tree-trunks (Jul. 10, 1972).

Mastigolejeunea humilis (Gott.) Schiffn. in Engl. & Prantl, Nat. Pfl.-fam. I, **3**: 129 (1895).

NEPAL. Dharan, 200–240 m, on tree-trunks (Jun. 1, 1972); Bir Gaon–Dingla, 1100 m, on tree-trunks (Jul. 1, 1972).

Distr. Widely distributed in tropical and subtropical Asia and Pacific Islands.

Ptychanthus striatus (Lehm. & Lindenb.) Nees: Fl. E. Himal. 531 (1966).

NEPAL. Dhankuta–Nigale, 1550–1860 m, on tree-trunks (Jun. 4, 1972); Hile–Chitre, 1950–2150 m, on tree-trunks (Jun. 5, 1972); Chitre–Basantapur, 2350 m, on tree-trunks (Jun. 6, 1972); Chauke–Lamo Pokhari, 2580–2850 m, on trunks and branches of trees (Jun. 8, 1972); Lamo Pokhari, 2700 m, on decaying branches (Jun. 9, 1972); Shewaden–Papung, 2350–2450 m, on branches (Jun. 29, 1972); Bir Gaon–Dingla, 1100 m, on tree-trunks (Jul. 1, 1972); Gupha Pokhari–Chauke, 2600 m, on branches (Jul. 4, 1972); Chauke-Dor, 2600–2650 m, on branches (Jul. 6, 1972); Dor–Chitre, 2350–2620 m, on branches (Jul. 7, 1972); Phulchoki, 1650 m, on branches (Jul. 15, 1972).

Spruceanthus semirepandus (Nees) Verd.: Fl. E. Himal. 532 (1966).

NEPAL. Chitre–Basantapur, 2350–2550 m, on tree-trunks (Jun. 6, 1972); Dor–Chauke, 2850 m, on tree-trunks (Jun. 7, 1972); Chauke–Lamo Pokhari, 2680–2850 m, on branches (Jun. 8, 1972); Suke, 2900 m, on tree-trunks (Jun. 10, 1972); Topke Gola–Shewaden, 2650 m, on branches (Jun. 28, 1972); Shewaden–Papung, 2000–2350 m, on branches (Jun. 29, 1972); Papung–Bir Gaon, 2050 m, on tree-trunks (Jun. 30, 1972).

Trocholejeunea infuscata (Mitt.) Verd.: Fl. E. Himal. 533 (1966).

NEPAL. Sanguri Bhanjyang, 1270 m, on rocks (Jun. 2, 1972); Kuwa Pani–Hile, 1870–1890 m, on rocks (Jun. 4, 1972); Hile–Chitre, 2150 m, on rocks (Jun. 5, 1972); Papung–Bir Gaon, 1800 m, on rocks (Jun. 30, 1972); Nessum–Bhuje, 1850 m, on rocks (Jul. 3, 1972); below Chitre, 2250 m, on rocks (Jul. 8, 1972).

Trocholejeunea sandvicensis (Gott.) Mizt.: Fl. E. Himal. 533 (1966).

NEPAL. Phulchoki, 2600 m, on tree-trunks (July 15, 1972).

Tuzibeanthus chinensis (Steph.) Mizt. in Journ. Hattori Bot. Lab. **24**: 151 (1961).

NEPAL. Near Sanguri Bhanjyang, 1260 m, on tree-trunks (Jun. 2, 1972); Phulchoki, 2400 m, on rocks (Jul. 15, 1972).

Distr. N.W. India (Mussoorie), Nepal, Burma, Thailand, China, and Japan. New to Nepal.

PELLIACEAE (by Sinske Hattori)

Calycularia crispula Mitt.: Fl. E. Himal. 534 (1966).

NEPAL. Dor–Chauke, 2750 m, on rocky cliff (Jun. 7, 1972); forest below Thudam, 3250 m, on humus-covered rock (Jun. 25, 1972); Shewaden–Papung, 2500 m, on rock (Jun. 29, 1972).

Distr. Himalaya, Thailand, Korea, and Japan.

Pellia Neesiana (Gott.) Limpr.: Fl. E. Himal. 534 (1966).

NEPAL. Chitre–Basantapur, 2350 m, on soil (Jun. 6, 1972).

METZGERIACEAE (by Sinske Hattori)

Apometzgeria pubescens (Schrank) Kuwah.: Fl. E. Himal. 543 (1966).

NEPAL. Chitre–Basantapur, 2350 m, on tree trunk (Jun. 6, 1972); Basantapur–Dor, 2350 m, on tree trunk (Jun. 6, 1972); coniferous forest above Topke Gola, 3610 m, on tree trunk (Jun. 18, 1972).

Metzgeria conjugata Lindb.

subsp. **japonica** (Hatt.) Kuwah.: Fl. E. Himal. 534 (1966).

NEPAL. Mossy forest below Lamo Pokhari, 2850 m, on tree trunk (Jun. 9, 1972); Suke–Hile Chok, 2980–3000 m, on humus and tree trunk (Jun. 11, 1972).

Distr. E. Africa, Madagascar, Himalaya, Annam, Sumatra, Borneo, Java, Philippines, Micronesia, Japan, Korea, and Saghalien.

Metzgeria hamata Lindb. in Act. Soc. F. Fl. Fenn. **1**: 25 (1877).

NEPAL. Basantapur–Dor, 2350 m, on tree trunk (Jun. 6, 1972); Phulchoki, summit area, 2400 m, on rocky cliff (Jul. 15, 1972).

Distr. Widely distributed in temparate to tropical regions in the world.

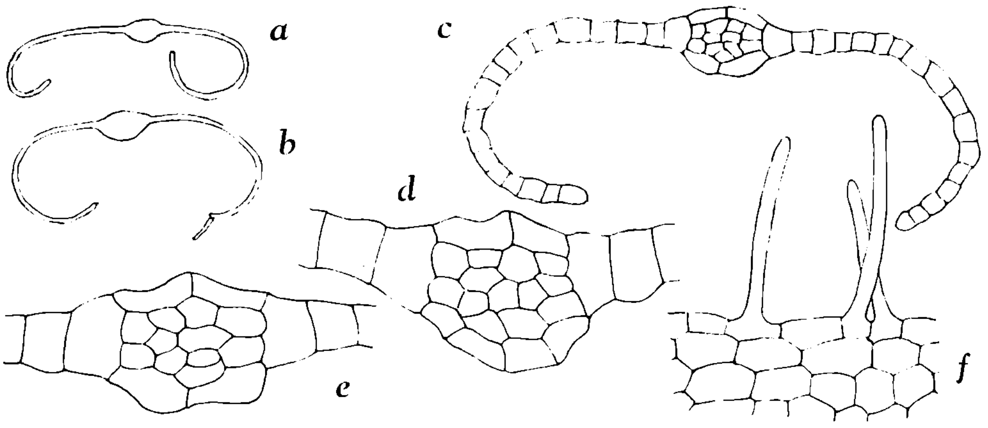

Fig. 32. *Metzgeria involvens* Hatt. a–c. Cross-sections of thalli, a, b ×27, c ×67, d–e. Cross-sections of midribs of thalli, ×138, f. Marginal portion of thallus, ×138. Drawn from type.

Metzgeria involvens Hatt., sp. nov. [Fig. 32]

Sterilis, frons olivacei-flavescens in herbario, dichotoma, convexa dorsale, ad 3 cm longa, ca. 1.5 mm lata. Alae valde involutae, 15–20 cellulas latae, margine solum parvisetuloso, setis soritaribus, strictis. Costa nuda, ventrale convexa, 2–4 cellulas lata, dorsale subplana, semper 2 cellulas lata, cellulis internis 10–15 seriatis, quam cellulis corticalibus multo minoribus, parietibus tenuibus. Cellulae alarum fere 28–38×10–20 μ metientes, parietibus tenuibus.

NEPAL. Gosa–Banduke Pokhari, 4050 m, on humus (Jun. 14, 1972); Topke Gola–Shewaden, 2850 m, on rock (Jun. 28, 1972, coll. Z. Iwatsuki no. 1914–holotype in NICH, dupl. in TI).

This new species is easily distinguished from other members of the genus known in the Himalayan and neighboring regions by its strongly involute thalli.

Metzgeria macrospora Kuwah.: Fl. E. Himal. **2**: 240 (1971).

NEPAL. Mossy forest below Lamo Pokhari, 2630–2700 m, on soil and branches of tree (Jun. 9, 1972); Suke–Hile Chok, 2970 m, on branches of tree (Jun. 11, 1972); Hile Chok–Ghopte, 3350 m, on fallen branches (Jun. 12, 1972); Ghopte–Gosa, 3850 m, on soil (Jun. 13, 1972); coniferous forest above Topke Gola, 3610 m, on fallen branches (Jun. 18, 1972); forest below Thudam, 3250 m, on tree-trunk (Jun. 25, 1972); Shewaden–Papung 2350 m, on leaves (Jun. 29, 1972); Dor, 2300 m, on rock (Jul. 6, 1972).

Metzgeria molokaiensis Kuwah.: Fl. E. Himal. 535 (1966).

NEPAL. Dor–Chauke, 2850 m, on rock (Jun. 7, 1972); forest below Thudam, 3250 m, on branches of tree (Jun. 25, 1972).

MARCHANTIACEAE (by Sinske Hattori)

Dumortiera hirsuta (Swartz) Reinw. et al. in Nova Act. Acad. Caes. Leop.-Carol. Nat. Cl. **12**: 410 (1824).

NEPAL. Mohamabedi Khola–Tamur Bridge, 370 m, on rock (Jun. 3, 1972); Doban–Nessum, 900 m, on rock (Jul. 2, 1972).

var. **nepalensis** (Tayl.) Frye et Clark: Fl. E. Himal. 535 (1966).

NEPAL. Hile–Chitre, 2350 m, on soil (Jun. 5, 1972); Papung–Bir Gaon, 1800 m, on rock (Jun. 30, 1972).

Distr. Var. *hirsuta*: Widely distributed in warm-temperate to tropic regions; var. *nepalensis*: India, Malaysia, Philippines, Formosa, China, Japan, Hawaii, Samoa, and N. & S. America.

Marchantia linearis Lehm. et Lindenb. in Lehm., Pugillus **4**: 8 (1832).

Nepal. Nigale-Kuwa Pani, 1850 m (Jun. 4, 1972); Kuwa Pani-Hile, 1860 m (Jun. 4, 1972); Bir Gaon-Dingla, 1550 m (Jul. 1, 1972).

Distr. India, Ceylon, and Malacca.

Marchantia paleacea Bertol.: Fl. E. Himal. 535 (1966); **2**: 240 (1971).

M. nepalensis Lehm. et Lindenb. in Lehm., Pugillus **4**: 10 (1832).

M. nitida Lehm. et Lindenb. in Lehm. in Journ. Hattori Bot. Lab. 11 (1932).

Nepal. Hile-Chitre, 2150 m, on soil (Jun. 5, 1972).

Marchantia subintegra Mitt. in Journ. Linn. Soc. Bot. **5**: 125 (1861).

Nepal. Nigale-Kuwa Pani, 1850 m, on soil (Jun. 4, 1972); Basantapur-Dor, 2350 m, on soil (Jun. 6, 1972); Shewaden-Papung, 2050 m, on soil (Jun. 29, 1972).

Distr. Nepal, Sikkim, and Bhutan.

Preissia quadrata (Scop.) Nees, Naturg. Eur. Leberm. **4**: 135 (1838).

Nepal. Topke Gola-Jalang Chhyongo, 4000 m, on soil (Jun. 20, 1972).

Distr. Europe, Himalaya, Japan, Siberia, and North America.

CONOCEPHALACEAE (by Sinske Hattori)

Conocephalum conicum (L.) Dum.: Fl. E. Himal. **2**: 240 (1971).

Nepal. Kuwa Pani-Hile, 1860 m, on rock (Jun. 4, 1972); Hile-Chitre, 2350 m, on soil (Jun. 5, 1972); Dor-Chauke, 2850 m, on soil (Jun. 7, 1972); Shewaden-Papung, 2500 m, on soil-covered rock (Jun. 29, 1972).

Wiesnerella denudata (Mitt.) Steph.: Fl. E. Himal. 536 (1966).

Nepal. Chauke-Lamo Pokhari, 2680 m, on soil (Jun. 8, 1972); Shewaden-Papung, 2250 m, on soil (Jun. 29, 1972).

EXORMOTHECACEAE (by Sinske Hattori)

Exormotheca tuberifera Kashyap in New Phytol. **13**: 309 (1914); Liverw. W. Himal. Panjab Pl. **1**: 47, pl. 7 (1929).

E. Gollani Steph., Sp. Hepat. **6**: 18 (1917).

Nepal. Banduke Pokhari, 4120 m, on soil (Jun. 14, 1972); coniferous forest above Topke Gola, 3650 m (Jun. 18, 1972); Topke Gola-Jalang Chhyongo, 3700 m, on soil (Jun. 20, 1972); Lama Chungbu-Thudam, 3750 m, on bank (Jun. 24, 1972).

Distr. Himalaya (Mussoorie and E. Nepal) and S. India (Madras).

REBOULIACEAE (by Sinske Hattori; *Asterella* by Riclef Grolle)

Asterella Blumeana (Nees) Pande et al. in Journ. Hattori Bot. Lab. **11**: 8 (1954).

Fimbriaria Blumeana Nees in Gott. et al., Synop. Hepat. 564 (1846).

Nepal. Hile-Chitre, 2050 m, on soil (Jun. 5, 1972); Papung-Bir Gaon, 1750–1850 m, on soil and bank (Jun. 30, 1972); Bir Gaon-Dingla, 1300–1610 m, on soil and soil-covered rock (Jul. 1, 1972); waterfall below Chitre, 2250 m, on rocky cliff (Jul. 8, 1972).

Distr. India, Nepal, and Java.

Asterella mussuriensis (Kashyap) Verd. in Ann. Bryol. **8**: 156 (1935).

Fimbriaria mussuriensis Kashyap in Journ. Bombay Nat. Hist. Soc. **24**: 345 (1916).

NEPAL. Shewaden-Papung, 2070-2350 m, on soil (Jun. 29, 1972); Nessum-Bhuje, 2700 m, on bank (Jul. 3, 1972); Chauke-Dor, 2850 m, on bank (Jul. 6, 1972).

Dist. India and Nepal.

Asterella reticulata (Kashyap) Pande et al. in Journ. Hattori Bot. Lab. **11**: 9 (1954).

Fimbriaria reticulata Kashyap, l.c. **25**: 270 (1917); Liverw. W. Himal. Panjab Pl. **1**: 65, pl. 14, 1-3 (1929).

NEPAL. Nessum-Bhuje, 2750 m, (Jul. 3, 1972).

Distr. India (Kashmir) and Nepal.

Mannia rupestris (Nees) Frye et Clark in Univ. Wash. Publ., Biol. **6**: 67, f. 1-6 (1937).

NEPAL. Mossy forest below Lamo Pokhari, 2850 m, on bank (Jun. 9, 1972); Thudam, 3350-3430 m, on soil and bank (Jun. 22, 1972); Thudam-Lama Chungbu, 3550 m, on soil (Jun. 23, 1972); Phulchoki, 2550 m, on rock (Jul. 15, 1972).

Distr. Europe, Nepal, Japan, and North America.

Plagiochasma articulatum Kashyap in New Phytol. **13**: 320 (1914); Liverw. W. Himal. Panjab Pl. **1**: 75, pl. 16, 1-3 (1929).

NEPAL. Thudam-Lama Chungbu, 3550 m, on soil (Jun. 23, 1972).

Distr. India and Nepal.

CLEVEACEAE (by Sinske Hattori)

Sauteria spongiosa (Kashyap) Hatt. in Journ. Hattori Bot. Lab. **12**: 62 (1954).

Sauchia spongiosa Kashyap in Journ. Bombay Nat. Hist. Soc. **24**: 347 (1916).

NEPAL. Lama Chungbu-Slesa, 4250 m, on soil (Jun. 24, 1972); forest below Thudam, 3250 m, on soil (Jun. 25, 1972); Thudam-Kipuphu, 3800 m, on bank (Jun. 26, 1972); Topke Gola-Shewaden, 3350 m, on soil (Jun. 28, 1972).

Distr. Himalaya.

TARGIONIACEAE (by Sinske Hattori)

Targionia hypophylla L.: Fl. E. Himal. 536 (1966).

NEPAL. Near Sanguri Bhanjyang, 1200 m, on soil (Jun. 2, 1972); Kuwa Pani-Hile, 1860 m, on rock (Jun. 4, 1972); Hile-Chitre, 2150 m, on rock (Jun. 5, 1972); Dor-Chauke, 2750 m, on rock (Jun. 7, 1972); Janga La-Thudam, 4550 m, on soil (Jun. 21, 1972); Shewaden-Papung, 2150 m, on rock (Jun. 29, 1972); Bir Gaon-Dingla, 1150-1610 m, on rock and soil-covered rock (Jul. 1, 1972); near waterfall below Chitre, 2250 m, on rocky cliff (Jul. 8, 1972); around Sanguri Banjyang, 1250 m, on rock (Jul. 10, 1972); Phulchoki, summit area, 2400 m, on rock (Jul. 15, 1972).

RICCIACEAE (by Sinske Hattori)

Riccia himalayensis Steph. in Kashyap in Journ. Bombay Nat. Hist. Soc. **24**: 349 (1916); Liverw. W. Himal. Panjab Pl. **1**: 93, pl. 20, 5-9 (1929).

NEPAL. Bir Gaon-Dingla, 1350 m, on rock (Jul. 1, 1972).

Distr. India and Nepal.

MUSCI (organized by Akira Noguchi and Zennoske Iwatsuki)[1]

SPHAGNACEAE (by Hyoji Suzuki)

Sphagnum cuspidatulum C. Muell.: Fl. E. Himal. 537 (1966).

NEPAL. Hile Chok–Ghopte, 3350 m, on soil, associated with *Sph. khasianum* (Jun. 12, 1972); Topke Gola–Shewaden, 3150 m, on soil (Jun. 28, 1972); loc. cit., 2850 m, on soil (Jun. 28, 1972); loc. cit., 2650 m, on soil (Jun. 28, 1972); Bhuje-Chauke, 2800 m, on soil (Jul. 4, 1972).

Sphagnum Girgensohnii Russ.: Fl. E. Himal. 538 (1966); **2**: 241 (1971).

NEPAL. Banduke Pokhari–Saju Pokhari, 4150 m, on soil (Jun. 15, 1972).

Sphagnum imbricatum Hornsch. ex Russ.: Fl. E. Himal. 538 (1966).

NEPAL. Phujeng La–Topke Gola, 3700 m, on soil (Jun. 27, 1972).

Distr. Europe, Caucasus, Himalaya (E. Nepal, Sikkim), Japan, Korea, Siberia, Kamchatka, Alaska, Canada, U.S.A., Central America, Cuba, and Chile. New to E. Nepal.

Sphagnum Junghuhnianum Dozy et Molk.

subsp. **pseudomolle** (Warnst.) H. Suzuki: Fl. E. Himal. 538 (1966).

NEPAL. Dor–Chauke, 2850 m, on soil (Jun. 7, 1972); Lamo Pokhari–Gupha Pokhari, 2850 m, on soil (Jun. 10, 1972); Gupha Pokhari–Suke, 2950 m, on soil (Jun. 10, 1972); Chauke–Dor, 2850 m, on soil (Jul. 6, 1972).

Distr. Himalaya (E. Nepal, Darjeeling, Sikkim), Thailand, Sumatra, Philippines, China (Yunnan, Szechuan, Kweichow, Chekiang), Formosa, Japan, and Canada (Queen Charlotte Islands).

Sphagnum khasianum Mitt.: Fl. E. Himal. 539 (1966).

NEPAL. In a mossy forest below Lamo Pokhari, 2680 m, on soil (Jun. 9, 1972); Topke Gola–Shewaden, 3150 m, on soil (Jun. 28, 1972); Shewaden–Papung, 2250 m, on soil (Jun. 29, 1972); Bhuje–Gupha Pokhari, 2800 m, on soil (Jul. 4, 1972).

Distr. Himalaya (E. Nepal, Darjeeling), India (Khasia Hills, Assam, Manipur), Thailand, and China (Yunnan, Szechuan). New to E. Nepal.

ANDREAEACEAE (by Zennoske Iwatsuki)

Andreaea densifolia Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 7 (1859).

NEPAL. Ghopte–Gosa, near Kobche, 4020 m, on rock (Jun. 13, 1972); Banduke Pokhari–Saju Pokhari, 4100 m, on rock (Jun. 15, 1972); Lama Chungbu–Slesa, 4250 m, on rock (Jun. 24, 1972).

Distr. E. Himalaya. New to Nepal.

Andreaea rupestris Hedw., Sp. Musc. 47 (1801).

NEPAL. Ghopte–Gosa, near Kobche, 4020 m, on rock (Jun. 13, 1972); Gosa–Banduke Pokhari, 4210 m, on rocky cliff (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola,

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[1] The following authorities are in charge of the study and preparation of manuscripts for the families in parentheses: Dr. H. Suzuki (Sphagnaceae), Dr. Gary L. Smith (Polytrichaceae), Dr. N. Takaki (Dicranaceae, Brachytheciaceae), Dr. K. Saito (Pottiaceae), Dr. H. Ochi (Funariaceae, Bryaceae, and Bartramiaceae), Dr. W. C. Steere (Splachnaceae), Dr. U. Mizushima (Entodontaceae), Dr. T. Seki (Sematophyllaceae), and Dr. H. Ando (Hypnaceae).

4100 m, on rock (Jun. 16, 1972).

Distr. Almost cosmopolitan.

TETRAPHIDACEAE (by Akira Noguchi)

Tetrodontium Brownianum (Dicks.) Schwaegr., Sp. Musc. Suppl. **2** (1): 102 (1824).

Nepal. In a mossy forest below Lamo Pokhari, 2650 m, on rocks (Jun. 9, 1972); Suke-Hile Chok, 3570 m, in crevices of rocks (Jun. 11, 1972).

Distr. Europe, Himalaya, Japan, New Zealand, and N. America. New to Himalaya.

POLYTRICHACEAE (by G. L. Smith)

Atrichum Haussknechtii Jur. & Milde in Verh. Zool.-Bot. Ges. Wien **20**: 598 (1870).

A. undulatum var. *Haussknechtii* (Jur. et Milde) Frye: Fl. E. Himal. 542 (1966).

Nepal. Dhankuta-Nigale, 1550 m (Jun. 4, 1972).

Distr. E. Europe, Asia, and W. N. America.

Atrichum longifolium Card. et Dixon ex Gangulee, Mosses E. India **1**: 81 (1969).

Nepal. In a mossy forest below Lamo Pokhari, 2650 m (Jun. 9, 1972); Topke Gola-Shewaden, 2600 m (Jun. 28, 1972); Shewaden-Papung, 2300–2500 m (Jun. 29, 1972).

Distr. Himalaya.

Atrichum pallidum Ren. & Card. in Bull. Soc. Bot. Belg. **34** (2): 63 (1896).

Nepal. Kuwa Pani-Hile, 1860 m (Jun. 4, 1972); Hile-Chitre, 1990–2350 m (Jun. 5, 1972); Papung-Bir Gaon, 1950 m (Jun. 30, 1972); Chauke-Dor, 2600 m (Jul. 6, 1972).

Distr. Himalaya and China.

Oligotrichum falcifolium (Griff.) G. Sm. in Phytologia **18**: 403 (1969).

O. semilamellatum (Hook. f.) Mitt.: Fl. E. Himal. 543 (1966).

O. aligerum Mitt.: Fl. E. Himal. **2**: 241 (1971).

Nepal. Hile-Chitre, 2150 m (Jun. 5, 1972); Basantapur (Bilbatay Bhanjyang)-Dor, 2350 m (Jun. 6, 1972); Topke Gola-Shewaden, 3350 m (Jun. 28, 1972, +*Pogonatum microstomum*); Shewaden-Papung, 2250 m (Jun. 29, 1972); Dor-Chitre, 2350 m (Jul. 7, 1972).

Distr. Himalaya.

Oligotrichum obtusatum Broth. in Symb. Sin. **4**: 133 (1929).

Nepal. Lama Chungbu-Slesa, 4350 m (Jun. 24, 1972); Thudam-Kipuphu, 3900 m (Jun. 26, 1972); Topke Gola-Shewaden, 3350 m (Jun. 28, 1972).

Distr. E. Nepal and China (Yunnan).

Pogonatum fastigiatum Mitt.: Fl. E. Himal. 543 (1966); **2**: 241 (1971).

Nepal. Suke-Hile Chok, 2980 m (Jun. 11, 1972).

Distr. Himalaya and S. W. China.

The plants treated as *Pogonatum cirratum* (Sw.) Brid. by Gangulee (Mosses E. India, 1969) are mostly *P. fastigiatum*; those he describes as *P. fastigiatum* and varieties of this species are *P. gymnophyllum* Mitt.

Pogonatum flexicaule Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 152 (1859).

Nepal. Dor–Chauke, 2850 m (Jun. 7, 1972).

Distr. Himalaya and E. Asia.

Pogonatum fuscatum Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 154 (1859).

Nepal. Shewaden–Papung, 2050 m (Jun. 29, 1972).

Distr. Himalaya.

Pogonatum gymnophyllum Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 153 (1859).

Nepal. Chitre–Basantapur, 2350 m (Jun. 6, 1972); Shewaden–Papung, 2500 m (Jun. 29, 1972).

Distr. Himalaya, E. Asia, and Malaysia.

Pogonatum microstomum (R. Br.) Brid.: Fl. E. Himal. 543 (1966); **2**: 241 (1971).

Nepal. Kuwa Pani–Hile, 1900 m (Jun. 4, 1972); Hile–Chitre, 1990–2050 m (Jun. 5, 1972); Dor–Chauke, 2630–2750 m (Jun. 7, 1972); Suke–Hile Chok, 2980–3000 m (Jun. 11, 1972); Topke Gola–Shewaden, 3250–3350 m (Jun. 28, 1972, +*Oligotrichum falcifolium*); Shewaden–Papung, 2350 m (Jun. 29, 1972); Bhuje–Gupha Pokhari, 2800 m (Jul. 4, 1972); in a forest near Chitre, 2350 m (Jul. 7, 1972); Phulchoki, 2100 m (Jul. 15, 1972).

Distr. Himalaya, E. Asia, and Malaysia.

Pogonatum Neesii (C. Müll.) Dozy et Molk., Bryol. Javan. **1**: 40 (1856).

P. akitense Besch. in Ann. Sci. Nat. Bot. ser. 7, **17**: 354 (1893).

P. Junghuhnianum (Dozy et Molk.) Dozy et Molk.: Fl. E. Himal. 543 (1966); **2**: 241 (1971).

Nepal. Near Sanguri Bhanjyang, 1200–1250 m (Jun. 2, 1972); Dhankuta–Nigale, 1720 m (Jun. 4, 1972); Hile–Chitre, 2000–2100 m (Jun. 5, 1972, +*Pogonatum perichaetiale*); Chauke–Lamo Pokhari, 2850 m (Jun. 8, 1972); Phulchoki, 2100 m (Jul. 15, 1972).

Distr. Caucasus, Himalaya, E. Asia, Malaysia, and Australia.

Pogonatum patulum (Harv.) Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 152 (1859).

Nepal. Near Sanguri Bhanjyang, 1250 m (Jun. 2, 1972).

Distr. E. Himalaya.

Pogonatum perichaetiale (Mont.) Jaeger: Fl. E. Himal. 543 (1966); **2**: 241 (1971).

Nepal. Hile–Chitre, 2000–2150 m (Jun. 5, 1972, +*Pogonatum Neesii*); Lamo Pokhari–Gupha (Shita) Pokhari, 2830 m (Jun. 10, 1972); Suke–Hile Chok, 2950 m (Jun. 11, 1972); Ghopte–Gosa, 4000 m (Jun. 13, 1972); Gosa–Banduke Pokhari, 4100 m (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola, 4300–4350 m (Jun. 16, 1972); Jalang Chhyongo–Janga La, 4600 m (Jun. 21, 1972); in a forest below Thudam, 3350–3420 m (Jun. 22, 1972, +*Pogonatum urnigerum*); Lama Chungbu–Slesa, 4250 m (Jun. 24, 1972); Bhuje–Gupha Pokhari, 2750 m (Jul. 4, 1972).

Pogonatum seminudum Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 152 (1859).

Nepal. Chauke–Dor, 2600 m (Jul. 6, 1972).

Distr. Himalaya.

Pogonatum tortipes (Mitt.) Jaeger: Fl. E. Himal. 544 (1966).

Nepal. Gosa–Banduke Pokhari, 4050 m (Jun. 14, 1972).

Distr. E. Himalaya and S. W. China.

Pogonatum urnigerum (Hedw.) Beauv.: Fl. E. Himal. 544 (1966).

Nepal. Suke-Hile Chok, 3170 m (Jun. 11, 1972); Hile Chok-Ghopte, 3350 m (Jun. 12, 1972); in a forest below Thudam, 3350 m (Jun. 22, 1972, +*Pogonatum perichaetiale*); Topke Gola-Shewaden, 3150 m (Jun. 28, 1972).

Distr. Widespread in Northern Hemisphere.

Polytrichastrum Emodi G. Sm. in Journ. Hattori Bot. Lab. **38**: 633 (1974).

Nepal. Lama Chungbu-Slesa, 4350 m (Jun. 24, 1972).

Distr. Nepal.

Polytrichastrum papillatum G. Sm. in Journ. Hattori Bot. Lab. **38**: 633 (1974).

Nepal. Janga La-Thudam, 4600 m (Jun. 21, 1972).

Distr. Kashmir and E. Nepal.

Polytrichastrum torquatum Mitt. ex Osada et G. Sm. in Journ. Hattori Bot. Lab. **38**: 636 (1974).

Nepal. Topke Gola-Shewaden, 3150-3250 m (Jun. 28, 1972).

Distr. E. Nepal and Bhutan.

Polytrichastrum xanthopilum (Mitt.) G. Sm. in Mem. N. Y. Bot. Gard. **21**(3): 35 (1971).

Polytrichum xanthopilum Mitt.: Fl. E. Himal. 544 (1966).

Nepal. Ghopte-Gosa, 4000-4020 m (Jun. 13, 1972); in a coniferous forest above Topke Gola, 3600-3650 m (Jun. 18, 1972); Topke Gola, in coniferous forest side of a pond, 3600 m (Jun. 19, 1972); Topke Gola-Jalang Chhyongo, 3650 m (Jun. 20, 1972); Thudam-Kipuphu, 4350 m (Jun. 26, 1972); Phujeng La-Topke Gola, 3700 m (Jun. 27, 1972).

Distr. E. Nepal and Sikkim.

FISSIDENTACEAE (by Zennoske Iwatsuki)

Fissidens anomalus Mont.: Fl. E. Himal. 544 (1966).

Nepal. Chitre-Basantapur, 2350 m, on tree trunk (Jun. 6, 1972); Dor-Chauke, 2850 m, on tree root (Jun. 7, 1972); Below Lamo Pokhari, 2850 m, on tree trunk (Jun. 9, 1972); Nessum-Bhuje, 2400 m, on tree trunk (Jul. 3, 1972); Chauke-Dor, 2600-2650 m, on tree trunk and branch (Jul. 6, 1972).

Fissidens areolatus Griff.: Fl. E. Himal. 544 (1966).

Nepal. Shewaden-Papung, 2500 m, on bank (Jun. 29, 1972).

Distr. Himalaya, Assam, Indo-China, Sumatra, Borneo, Philippines, China, Formosa, and Japan.

Fissidens biformis Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 141 (1859).

Nepal. Hile-Chitre, 1990 m, on rock (Jun. 5, 1972); Dor-Chauke, 2730 m, on soil (Jun. 7, 1972); Shewaden-Papung, 2250 m, on soil covered rock (Jun. 29, 1972).

Distr. Ceylon, Himalaya, and S. India.

Fissidens bryoides Hedw., Sp. Musc. 153 (1801).

Nepal. Topke Gola-Shewaden, 2850 m, on soil covered rocks (Jun. 28, 1972); Shewaden-Papung, 2400 m, on bamboo (Jun. 29, 1972).

Distr. Widely distributed in the Northern Hemisphere and S. America.

Fissidens grandifrons Brid.: Fl. E. Himal. 544 (1966); **2**: 242 (1971).

Nepal. Topke Gola-Shewaden, 3400 m, on rock in a stream (Jun. 28, 1972).

Fissidens Kurzii C. Muell. in Linnaea **37**: 163 (1872).

Nepal. Chauke-Lamo Pokhari, 2620 m, on rock and soil (Jun. 8, 1972); Papung-Bir Gaon, 1950 m, on rock (Jun. 30, 1972).

Distr. Himalaya and Burma.

Fissidens laxitextus Broth. ex Gangulee in Nova Hedwigia **8**: 144 (1964).

Nepal. Shewaden-Papung, 2400 m, on soil (Jun. 29, 1972).

Distr. E. Himalaya.

Fissidens Mittenii Par., Index Bryol. 477 (1896).

Nepal. Dor-Chauke, 2650 m, on soil (Jun. 7, 1972); Shewaden-Papung, 2250-2350 m, on rocks (Jun. 29, 1972); Chauke-Dor, 2750 m, on bank (Jul. 6, 1972).

Distr. Ceylon, S. India, Himalaya, Indo-China, Indonesia, Philippines, Formosa, and Japan.

Fissidens nobilis Griff.: Fl. E. Himal. 545 (1966).

Nepal. Papung-Bir Gaon, 1800 m, on rock (Jun. 30, 1972); Bir Gaon-Dingla, 1050 m, on rocky cliff (Jul. 1, 1972).

Distr. Ceylon, Himalaya (Nepal, Sikkim), Khasia, Assam, Indo-China, Indonesia, Philippines, New Guinea, China, Formosa, and Japan.

Fissidens Nymanii Fleisch., Musci Fl. Buitenz. **1**: 19 (1902).

Nepal. Phulchoki, 2100 m, on clayey soil (Jul. 15, 1972).

Distr. Himalaya, S. India, Java, and Borneo.

Fissidens obscurus Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 138 (1859).

Nepal. Bhuje-Gupha Pokhari, 2800 m, on soil (Jul. 4, 1972).

Distr. Himalaya and E. India.

Fissidens Rambii Gangulee, Mosses E. India **2**: 475 (1971).

Nepal. Chauke-Dor, 2600 m, on rock (Jul. 6, 1972).

Distr. Endemic to E. Himalaya.

Fissidens Schmidii C. Muell. in Bot. Zeit. **11**: 18 (1853).

Nepal. Basantapur-Dor, 2350 m, on soil (Jun. 6, 1972); Shewaden-Papung, 2400 m, on base of tree (Jun. 29, 1972); Dingla-Doban, 1000 m, on rock (Jul. 2, 1972); Gupha Pokhari-Chauke, 2600 m, on stone wall (Jul. 4, 1972); near Chitre, 2350 m, on tree trunk (Jul. 7, 1972).

Distr. C. Africa, Pakistan, Ceylon, Himalaya, S. India, Malay, Java, New Guinea, Philippines, and Japan.

Fissidens splachnobryoides Broth. in Schum. et Lauterb., Fl. Deutsch. Schutzgeb. Suedsee 81 (1900).

Nepal. In a *Shorea* forest south of Dharan, 200-240 m, on soil (Jun. 1, 1972); Bir Gaon-Dingla, 1300 m, on soil covered rock (Jul. 1, 1972).

Distr. Ceylon, Himalaya, S. India, Burma, Java, Borneo, New Guinea, Philippines, Formosa, and Japan.

Fissidens sylvaticus Griff. in Calcutta Journ. Nat. Hist. **2**: 507 (1842).

Nepal. Chitre-Basantapur, 2350 m, on soil (Jun. 6, 1972); Basantapur-Dor, 2350 m, on soil (Jun. 6, 1972); Dor-Chauke, 2750 m, on rock (Jun. 7, 1972); Shewaden-Papung, 2200-2250 m, on rocks (Jun. 29, 1972); Bir Gaon-Dingla, 1050-1610 m, on rocks (Jul. 1, 1972); Phulchoki, 2400 m, on rock (Jul. 15, 1972).

Distr. C. Africa, Madagascar, Algeria, Ceylon, India, Himalaya, Burma, Indo-China, Indonesia, China, Philippines, New Guinea, Samoa, and New Zealand.

Fissidens taxifolius Hedw., Sp. Musc. 155 (1801).

NEPAL. Chitre–Basantapur, 2350 m, on soil (Jun. 6, 1972); Chauke–Lamo Pokhari, 2680 m, on bank (Jun. 8, 1972); Dingla–Doban, 1000 m, on bank (Jul. 2, 1972); Nessum–Bhuje, 1800 m, on rock (Jul. 3, 1972); Chauke–Dor, 2600 m, on bank (Jul. 6, 1972); Phulchoki, 2400 m, on soil (Jul. 15, 1972).

Distr. Almost cosmopolitan.

Fissidens xiphioides Fleisch. in Hedwigia **38** (Beibl.): 125 (1899).

NEPAL. Below Lamo Pokhari, 2630 m, on decaying tree (Jun. 9, 1972); Shewaden–Papung, 2200–2500 m, on rock (Jun. 29, 1972).

Distr. S. India, Himalaya, Burma, Thailand, Vietnam, Java, Philippines, Formosa, and Japan.

DITRICHACEAE (by Zennoske Iwatsuki)

Ceratodon purpureus Brid.: Fl. E. Himal. 545 (1966).

NEPAL. Saju Pokhari–pass to Topke Gola, 4350 m, on soil (Jun. 16, 1972); in a *Rhododendron* forest above Topke Gola, 3610 m, on soil covering rocks (Jun. 18, 1972); Topke Gola–Jalang Chhyongo, 3910 m, on soil (Jun. 20, 1972); Janga La–Thudam, 4200 m, on dung (Jun. 21, 1972); in a forest below Thudam, 3250 m, on soil (Jun. 25, 1972); Phujeng La–Topke Gola, 4050 m, on soil (Jun. 27, 1972).

Distichium capillaceum (Hedw.) B.S.G.: Fl. E. Himal. **2**: 242 (1971).

NEPAL. Ghopte–Gosa, 3870 m, on rock (Jun. 13, 1972); Banduke Pokhari–Saju Pokhari, 4200 m, in crevices of cliff (Jun. 15, 1972); Saju Pokhari–pass to Topke Gola, 4230 m, on soil covering rocks (Jun. 16, 1972); Topke Gola, a coniferous forest by a pond, 3600 m, on rocks (Jun. 19, 1972); Jalang Chhyongo–Janga La, 4510 m, on soil (Jun. 21, 1972); Janga La–Thudam, 4400–4600 m, on rocks and soil (Jun. 21, 1972); around Kipuphu, 4550 m, on rock (Jun. 26, 1972); Kipuphu–Phujeng La, 4650 m, on soil (Jun. 27, 1972); Topke Gola–Shewaden, 3450 m, on rocks (Jun. 28, 1972).

Garckea comosa (Doz. et Molk.) Wijk et Marg. in Taxon **9**: 190 (1960).

NEPAL. Around Sanguri Bhanjyang, 1250 m, on rocks (Jul. 10, 1972).

Distr. Tropical Asia (including E. Himalaya), Formosa, Japan, Australia, Oceania, and C. America.

DICRANACEAE (by Noriwo Takaki)

Aongstroemia orientalis Mitt.: Fl. E. Himal. 545 (1966)–Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 361 (1966), det. Iwatsuki.

NEPAL. Basantapur–Dor, 2350 m, on rocks (Jun. 6, 1972); Dor–Chauke, 2650–2750 m, on humus, rocks, and rocky cliff (Jun. 7, 1972); Chauke–Lamo Pokhari, 2630 m, on soil (Jun. 8, 1972); Lamo Pokhari–Gupha Pokhari, 2850 m, in crevices of rock (Jun. 10, 1972); Gupha Pokhari–Suke, 2950 m, on humus (Jun. 10, 1972); Suke–Hile Chok, 3350 m, on soil (Jun. 11, 1972); Hile Chok–Ghopte, 3350 m (Jun. 12, 1972); Ghopte–Gosa, 3800 m, on soil and rocks (Jun. 13, 1972); around Banduke Pokhari, 4120 m, on soil (Jun. 14, 1972); Janga La–Thudam, 4400 m, in crevices of rock (Jun. 21, 1972); in a forest below Thudam, 3420 m, on soil (Jun. 22, 1972); Kipuphu–Phujeng La, 4600 m, in crevices of rock (Jun. 27, 1972); Topke Gola–Shewaden, 3350 m, on rocks (Jun. 28, 1972); Chauke–Dor, 2850 m, on bank (Jul. 6, 1972); Mangen–Khodang Danda, 2500–3100 m (Aug. 28, 1972).

DARJEELING. Phalut–Singalila, 3600–3700 m (Aug. 3, 1972).

Distr. W. Himalaya, Nepal, Sikkim, Bhutan, Burma, S. W. China (Yunnan, Szechuan), N. Borneo, Philippines, Formosa, Japan, Siberia, and Mexico.

Atractylocarpus erectifolius Mitt. ex Dix. in Not. Bot. Gard. Edinb. **19**: 281 (1938).

Nepal. Lama Chungbu–Slesa, 4200 m, on dung? (Jun. 24, 1972).

Distr. E. Himalaya (E. Nepal, Bhutan).

Brothera himalayana Broth. in Nat. Pfl. **1**(3): 330 (1901)–Tak. in Journ. Hattori Bot. Lab. **31**: 289, f. 3 (1968).

Nepal. Suke–Hile Chok, 3500 m, on soil (Jun. 11, 1972); in a forest below Thudam, on bank (Jun. 25, 1972); Shewaden–Papung, 2200 m, on rotten logs (Jun. 29, 1972), det. Iwatsuki.

Distr. E. Himalaya (E. Nepal, Sikkim).

Bearing numerous fruits. These specimens agree well with the type specimen in structural details mentioned by the writer in 1968.

Brothera Leana (Sull.) C. Muell.: Fl. E. Himal. 545 (1966), det. Iwatsuki.

Nepal. Hile–Chitre, 2150 m, on fallen log (Jun. 5, 1972); Basantapur–Dor, 2370 m (Jun. 6, 1972).

Campylopodiella tenella Card. in Bull. Herb. Boiss. sér. 2, **8**: 90, f. 1 (1908)–Tak. in Journ. Hattori Bot. Lab. **37**: 512, f. 1, 2 (1973).

Nepal. In a forest below Thudam, 3250 m (Jun. 25, 1972).

Distr. E. Nepal and Sikkim.

Two packets. One of them was found on log being charred by the fire, and another one was on fragments of rotten trunk. In the latter packet, this is mixed with *Brothera himalayana.*

Campylopus Goughii (Mitt.) Jaeg.: Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 363 (1966).

Nepal. Suke–Hile Chok, 3200 m, on soil (Jun. 11, 1972).

Distr. S. India, Ceylon, W. Himalaya, E. Nepal, Sikkim, Bhutan, and Khasia.

Campylopus nilghiriensis (Mitt.) Jaeg.: Fl. E. Himal. 546 (1966); **2**: 242 (1971)–Nog. et al., l.c. **9**: 363 (1966).

Nepal. Basantapur–Dor, 2550 m, on rocky cliff (Jun. 6, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972).

Distr. Himalaya (C. & E. Nepal, Sikkim, Bhutan) and E. India.

Campylopus Richardii Brid.: Fl. E. Himal. 546 (1966).

Nepal. Kuwa Pani–Hile, 1900 m, on soil (Jun. 4, 1972); Hile–Chitre, 1900, 1990, 2250 m, on rocks (Jun. 5, 1972); Basantapur–Dor, 2350 m, on decaying log (Jun. 6, 1972); Dor–Chauke, 2850 m, on rocky cliff (Jun. 7, 1972); Shewaden-Papung, 2500 m, on rock (Jun. 29, 1972).

Distr. India, Ceylon, Himalaya, Khasia, Burma, Malay, Sumatra, Borneo, Celebes, Tahiti, Philippines, China (Kwangsi, Fukien), Formosa, and Japan.

This is apparently a common and abundant moss in Nepal.

Campylopus Schwarzii Schimp.: Fl. E. Himal. 546 (1966)–Nog. et al., l.c. **9**: 363 (1966).

Nepal. Dor–Chauke, 2730 m, on rock (Jun. 7, 1972); Ghopte–Gosa, 3800 m, on soil and rock, 4000 m, on soil (Jun. 13, 1972); Gosa–Banduke Pokhari, 4050 m, on soil and rock (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola, 4000–4400 m, on soil

(Jun. 16, 1972); Lama Chungbu–Slesa, 4200–4500 m (Jun. 24, 1972); Topke Gola–Shewaden, 3400 m, on soil (Jun. 28, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972); Thale Patil–Mangen, 3100–3400 m (Aug. 27, 1972).

Distr. Europe, E. Himalaya (Nepal), Formosa, Korea, Japan, and N. America. This is apparently quite common in Nepal.

Campylopus subgracilis Ren. et Card.: Fl. E. Himal. 547 (1966).

NEPAL. Lamo Pokhari–Gupha Pokhari, 2830 m, on bank (Jun. 10, 1972).

Cynodontium gracilescens (Web. et Mohr) Schimp. in Bruch, Schimper & Gümbel, Bryol. Eur. Coroll. 12 (1846).

NEPAL. Basantapur–Dor, 2370 m, on decaying tree trunk (Jun. 6, 1972); loc. cit., 2510 m, on soil (Jun. 6, 1972).

Distr. Greenland, Europe, Caucasus, E. Nepal, Sikkim, China, Japan, Amur, and N. America.

Dichodontium pellucidum (Hedw.) Schimp.: Fl. E. Himal. **2**: 242 (1971).

NEPAL. In a forest below Thudam, 3420 m, on soil (Jun. 22, 1972).

Distr. Europe, Caucasus, Pakistan, E. Nepal, Sikkim, Japan, and N. America.

Dicranella heteromalla (Hedw.) Schimp.: Fl. E. Himal. 547 (1966); **2**: 242 (1971)-Nog. et al., l.c. **9**: 363 (1966).

NEPAL. In a mossy forest below Lamo Pokhari, 2650 m, on rock (Jun. 9, 1972); Suke, 2900 m, on bank (Jun. 10, 1972); Suke–Hile Chok, 3250 m, on soil (Jun. 11, 1972); Phujeng La–Topke Gola (Jun. 27, 1972); Bhuje–Gupha Pokhari, 2800 m, on soil (Jul. 4, 1972).

Distr. Cosmopolitan, including N. & C. Africa, Europe, Caucasus, C. Asia, W. Himalaya, E. Nepal, Sikkim, Bhutan, Assam, E. Tibet, Japan, Korea, Amur, and America.

Dicranodontium asperulum (Mitt.) Broth.: Fl. E. Himal. 548 (1966)-Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 363 (1966).

NEPAL. Dor–Chauke, 2850 m, on rock (Jun. 7, 1972); around Banduke Pokhari, 4120 m, in crevices of rock (Jun. 14, 1972); Topke Gola–Jalang Chhyongo, 3750 m, on soil (Jun. 20, 1972).

Distr. Europe, E. Nepal, Sikkim, Naga Hills, Yunnan, Japan, and N. America.

Dicranodontium denudatum (Brid.) Britt.: Fl. E. Himal. 548 (1966); **2**: 242 (1971).

NEPAL. Basantapur–Dor, 2300 & 2350 m, on decaying stump and tree trunk (Jun. 6, 1972); Chauke–Lamo Pokhari, 2850 m, on tree trunk (Jun. 8, 1972); Ghopte–Gosa, 3700 m, on rotten log (Jun. 13, 1972).

Distr. Europe, Caucasus, E. Nepal, Sikkim, China, Japan, Siberia, and N., C. & S. America.

Dicranodontium uncinatum (Harv.) Jaeg.: Fl. E. Himal. 550 (1966)-Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 363 (1966).

NEPAL. Basantapur–Dor, 2550 m, on tree trunk (Jun. 6, 1972); Ghopte–Gosa, 3750 m, on rock and soil (Jun. 13, 1972).

Distr. Europe, Ceylon, E. Nepal, Sikkim, Khasia, Manipur, Burma, Indo-China, Java, Moluccas, Philippines, Formosa, and Japan.

Dicranoweisia alpina (Mitt.) Par., Index Bryol. 339 (1896).

NEPAL. Around Kipuphu, 4550 m, in crevices of cliff (Jun. 26, 1972).

Distr. Himalaya (E. Nepal and Sikkim).

Dicranoweisia indica (Wils.) Par., Index Bryol. 341 (1896).

Nepal. Around Kipuphu, 4550 m, in crevices of cliff (Jun. 26, 1972).

Distr. W. Himalaya, E. Nepal, Sikkim, and Yunnan.

Dicranum crispifolium C. Muell.: Fl. E. Himal. 550 (1966); **2**: 242 (1971).

Nepal. Topke Gola–Shewaden, 3150 m, on humus (Jun. 28, 1972).

Dicranum gymnostomum Mitt.: Fl. E. Himal. 550 (1966)-Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 364 (1966).

Nepal. In *Rhododendron* forest above Topke Gola, 3610 m, on soil (Jun. 18, 1972); Thudam–Lama Chungbu, 3650 m, on tree trunk (Jun. 23, 1972).

Distr. E. Nepal, Sikkim, Burma, and Yunnan.

Readily known by the narrow-mouthed and oblong-cylindrical capsules lacking peristome teeth.

Dicranum himalayanum Mitt.: Fl. E. Himal. 550 (1966)-Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 364 (1966).

Nepal. Suke–Hile Chok, 3550 m, on tree trunk (Jun. 11, 1972); Topke Gola, 3600 m (Jun. 17, 1972); Topke Gola–Shewaden, 3300 m, on branch (Jun. 28, 1972).

When sterile, this is known by the leaf margin being entire throughout.

Dicranum lorifolium Mitt.: Fl. E. Himal. 550 (1966).

Nepal. In a mossy forest below Lamo Pokhari, on rock (Jun. 9, 1972); Dor–Chitre, 2500 m, on humus, 2630 m, on tree trunks (Jul. 7, 1972).

Dicranum scoparium Hedw.: Fl. E. Himal. 550 (1966); **2**:243 (1971)-Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 364 (1966).

Nepal. Dor–Chauke, 2850 m, on rock (Jun. 7, 1972).

Oncophorus Wahlenbergii Brid.: Fl. E. Himal. 550 (1966); **2**: 243 (1971)-Nog. et al., l.c. **9**: 364 (1966).

Nepal. Suke–Hile Chok, 3600 m, on humus (Jun. 11, 1972); Ghopte–Gosa, 3700 m, on rock (Jun. 13, 1972); Banduke Pokhari–Saju Pokhari, 4200 m, on humus (Jun. 15, 1972); Topke Gola–Shewaden, 3300 m, on branch (Jun. 28, 1972).

Distr. Europe, Caucasus, W. Himalaya, W. & E. Nepal, Sikkim, Yunnan, Korea, Japan, Siberia, and N. America.

Oreoweisia laxifolia (Hook. f.) Kindb.: Fl. E. Himal. 551 (1966); **2**: 243 (1971)-Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 364 (1966).

Nepal. Hile–Chitre, 2300 m, on tree trunk (Jun. 5, 1972); Basantapur–Dor, 2510 m, on rocky cliff (Jun. 6, 1972); in a mossy forest below Lamo Pokhari, 2850 m (Jun. 9, 1972); Banduke Pokhari–Saju Pokhari, 4150 m, on rock (Jun. 15, 1972); in a coniferous forest above Topke Gola, 3650 m, in crevices of rock (Jun. 18, 1972); Topke Gola–Jalang Chhyongo, 3750 m, on rock (Jun. 20, 1972).

This is apparently quite common in Nepal. Fruits are found in 6 of 7 packets.

Paraleucobryum enerve (Thed.) Loesk.: Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 364 (1966).

Nepal. Suke–Hile Chok, 3000–3600 m, on humus (Jun. 11, 1972); Ghopte–Gosa, 4000 m, on soil (Jun. 13, 1972); Gosa–Banduke Pokhari, 4050 m, in crevices of rock (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola, 4200 m, on rock (Jun. 16, 1972); around Kipuphu, 4550 m, on soil (Jun. 26, 1972); around Phujeng La, 4750 m, on soil (Jun. 27, 1972); Gosainkund–Gopte, 3500–4200 m (Aug. 25, 1972).

Distr. Europe, Caucasus, W. Himalaya, C. & E. Nepal, Sikkim, China, Formosa, Japan, Aleutians, and N. America.

This seems to be one of the commonest mosses in Nepal.

Rhabdoweisia crenulata (Mitt.) James in Rev. Bryol. **17**: 6 (1890).

NEPAL. Ghopte–Gosa, 3500 m, on humus (Jun. 13, 1972); around Banduke Pokhari, 4050 & 4120 m, on soil (Jun. 14, 1972); in a coniferous forest above Topke Gola, 3610 m, on soil (Jun. 18, 1972); Topke Gola–Shewaden, 3550 m, on soil (Jun. 28, 1972); Shewaden–Papung, 2350 m, on rock (Jun. 29, 1972).

Distr. N. & S. Africa, E. Nepal, Sikkim, Formosa, and America.

Symblepharis vaginata (Hook.) Wijk et Marg. in Taxon **8**: 75 (1959).

S. helicophylla Mont.: Fl. E. Himal. 551 (1966); **2**: 243 (1971)–Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 364 (1966).

NEPAL. Basantapur–Dor, 2550 m, on rock (Jun. 6, 1972); Dor–Chauke, 2850 m, on tree trunk (Jun. 7, 1972); Chauke–Lamo Pokhari, 2850 m, on tree trunk (Jun. 8, 1972); in a mossy forest below Lamo Pokhari, 2850 m, on fallen branch (Jun. 9, 1972); Suke–Hile Chok, 3200 m, on tree trunk (Jun. 11, 1972); in a coniferous forest above Topke Gola, 3610 m, on fallen branch (Jun. 18, 1972); Topke Gola–Shewaden, 2850 & 3300 m, on rock (Jun. 28, 1972); Gopte–Thale Patil, 3400–3500 m (Aug. 26, 1972).

Distr. W. Himalaya, C. & E. Nepal, Sikkim, Bhutan, Assam, Naga Hills, China (Yunnan, Szechuan), and N. & C. America (Mexico to Panama).

This seems to be one of the commonest mosses in Nepal. Fruits are found in all the 10 packets.

Trematodon conformis Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 12 (1859).

NEPAL. Summit area of Phulchoki, 2600 m, on soil (Jul. 15, 1972).

Distr. S. India, W. Himalaya, C. & E. Nepal, Sikkim, Bhutan, and Indo-China.

Trematodon Kurzii Hamp. ex Gangulee in Bull. Bot. Soc. Beng. **14**: 12 (1960).

NEPAL. Dingla–Doban, 1000 m, on soil (Jul. 2, 1972).

Distr. E. Nepal, Sikkim, and Burma.

This species is characterized in having distinctly papillose and subobscure laminal cells in the extending upper part of the leaf.

LEUCOBRYACEAE (by Akira Noguchi)

Octoblepharum albidum Hedw.: Fl. E. Himal. 551 (1966).

NEPAL. Swayambhu temple, 1500 m (May 28, 1972); Papung–Bir Gaon, 1800 m, on tree trunks (Jun. 30, 1972); Dingla–Doban, 950 m, on tree trunks (Jul. 2, 1972); Phulchoki, 1650 m, on tree trunks (Jul. 15, 1972).

CALYMPERACEAE (by Zennoske Iwatsuki)

Syrrhopodon Gardneri (Hook.) Schwaegr.: Fl. E. Himal. 551 (1966).

NEPAL. Chitre–Basantapur, 2350 m (Jun. 6, 1972); Chauke–Lamo Pokhari, 2620 m (Jun. 8, 1972); Papung–Bir Garon, 1950 m (Jun. 30, 1972).

Distr. Ceylon, Himalaya, Khasia, Indo-China, Java, Borneo, Philippines, and N. E. New Guinea.

ENCALYPTACEAE (by Zennoske Iwatsuki)

Encalypta alpina Sm. in Engl. Bot. **20**: 1419 (1805).

NEPAL. Janga La–Thudam, 4600 m, on soil (Jun. 21, 1972).

Distr. Europe, Africa, E. Himalaya, Mongol, Japan, Siberia, and N. America. New to Himalaya.

Encalypta ciliata Hedw., Sp. Musc. 61 (1801).

NEPAL. Saju Pokhari-pass to Topke Gola, 4230 m, in crevices of cliff (Jun. 16, 1972); in a coniferous forest above Topke Gola, 3610 m, on soil (Jun. 18, 1972); Thudam–Lama Chungbu, 3550 m (Jun. 23, 1972); Thudam–Kipuphu, 3800 m, on bank (Jun. 26, 1972); Topke Gola, 3600 m, on stone wall (Jun. 28, 1972).

Distr. Widely spread in the Northern Hemisphere (including C. America, N. W. part of S. America), Australia, and New Zealand.

POTTIACEAE (by Kamezo Saito)

Anoectangium aestivum (Hedw.) Mitt. in Journ. Linn. Soc. **12**: 175 (1869).

NEPAL. Janga La–Thudam, 4580 m (Jun. 21, 1972); Shewaden–Papung, 2350 m (Jun. 29, 1972); Papung–Bir Gaon, 1950 m (Jun. 30, 1972).

Distr. Widely distributed in the Northern Hemisphere and New Zealand. New to E. Himalaya.

Anoectangium clarum Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 31 (1859).

NEPAL. Dor–Chauke, 2850 m (Jun. 7, 1972); Hile Chok–Ghopte, 3500 m (Jun. 12, 1972).

Distr. Himalaya and China (Yunnan).

Anoectangium Stracheyanum Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 31 (1859).

NEPAL. Bir Gaon–Dingla, 1300 m (Jul. 1, 1972); Dunche–Singum Gompa, 2000–2300 m (Aug. 22, 1972).

Distr. Himalaya, India, Burma, Vietnam, and China.

Anoectangium Thomsonii Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 31 (1859).

NEPAL. Hile–Chitre, 2150 m (Jun. 5, 1972); Shewaden–Papung, 2200 m (Jun. 29, 1972).

Distr. Himalaya, India, China, Japan, and Siberia.

Barbula amplexifolia (Mitt.) Jaeg. in Ber. S. Gall. Naturw. Ges. **1871–1872**: 424 (1873).

Tortula amplexifolia Mitt., l.c. **1**: 29 (1859).

Hydrogonium amplexifolium (Mitt.) Chen in Hedwigia **80**: 240 (1941).

NEPAL. Phulchoki, 2650 m (Jul. 15, 1972).

Distr. Himalaya.

Barbula arcuata Griff. in Calcutta Journ. Nat. Hist. **2**: 491 (1842).

Hydrogonium arcuatum (Griff.) Wijk et Marg. in Taxon **7**: 289 (1958).

NEPAL. Mohamabedi Khola–Tamur Bridge, 370 m (Jun. 3, 1972).

Distr. Himalaya, India, Burma, Indo-China, Java, New Guinea, Borneo, Philippines, China, Formosa, and Japan.

Barbula confertifolia Mitt. in Journ. Linn. Soc. Bot. Suppl. **1**: 36 (1859).

NEPAL. Chauke-Dor, 2650 m (Jul. 6, 1972).

Distr. Endemic to Himalaya.

There has been known no asexual reproductive organ for this species. In our collection, many, brown, unicellular gemmae are sprouting from leaf-axils in group without any gemmifer. Although the ovate leaves with an obutse apex and the mode of gemmae formation are very similar to those of *B. perobtusa* (Broth.) Chen, this species is distinguished from *B. perobtusa* by the presence of three to four, C-shaped papillae on lamina cells.

Barbula javanica Doz. et Molk. in Ann. Sci. Nat. Bot. sér. 3, **2**: 300 (1844).

Hydrogonium javanicum (Doz. et Molk.) Hilp. in Beih. Bot. Centralbl. **50**: 632 (1933).

NEPAL. Bir Gaon-Dingla, 1550 m (Jul. 1, 1972); Dingla-Doban, 800 m (Jul. 2, 1972).

Distr. Himalaya, India, Ceylon, Java, Philippines, and China.

Bellibarbula Kurziana (Hampe) Chen: Fl. E. Himal. 552 (1966).

NEPAL. Hile Chok-Ghopte, 3400 m (Jun. 12, 1972).

Distr. Himalaya and India.

Bryoerythrophyllum dentatum (Wils.) Chen: Fl. E. Himal. 552 (1966).

NEPAL. Thudam-Kipuphu, 4200 m (Jun. 26, 1972).

Distr. Himalaya, India, and Indo-China.

Bryoerythrophyllum Noguchianum (Gangulee) Saito, stat. nov.

B. yunnanense (Herz.) Chen var. *Noguchianum* Gangulee, Moss. E. Ind. **3**: 750 (1972).

B. yunnanense (Herz.) Chen sensu Noguchi in Fl. E. Himal. 552 (1966).

NEPAL. Thudam, 3420 m (Jun. 22, 1972).

Distr. Endemic to Himalaya (Nepal).

This species was first recognized by Noguchi (1966) who temporary reported it as *Bryoerythrophyllum yunnanense* (Herz.) Chen and referred to a difference in dentating portion of leaf margin between his material (NICH 201496, holotype of var. *Noguchianum*) and the figures of *B. yunnanense* by Chen (cf. Hedwigia **80**: 256, 1941). Later Gangulee (1972) described the plant as a new variety, *B. yunnanense* var. *Noguchianum* Gangulee, by the difference in having the leaf-margin revolute only at the base of leaves and not all along up to a little below the tip.

The leaves of *B. yunnanense* (Ten 67a, holotype in B) are narrowly lanceolate with obtuse apex, and their marginal teeth are irregular in shape and angle, while the leaves of *B. Noguchianum* are narrowly spatulate to narrowly ligulate with an acute apex, and their marginal teeth are regular in shape and angle. Differences in these characters are sufficient to distinguish both taxa from each other, and *B. Noguchianum* seems to be rather similar to *B. Wallichii* as regarding above mentioned characters.

Bryoerythrophyllum recurvum (Griff.) Saito, comb. nov.

Gymnostomum recurvum Griff. in Calcutta Journ. Nat. Hist. **2**: 48 (1842).

Didymodon recurvus (Griff.) Broth. in Nat. Pfl. **1** (3): 405 (1902).

NEPAL. Hile-Chitre, 2300 m (Jun. 5, 1972); Dor-Chauke, 2750 m (Jun. 7, 1972); Papung-Bir Gaon, 1850 m (Jun. 30, 1972); Bir Gaon-Dingla, 1300 m (Jul. 1, 1972); Nessum-Bhuje, 1450 m (Jul. 3, 1972).

Distr. Himalaya and India.

This species has long been treated as a member of the genus *Didymodon*, but it differs from *D. rigidulus* which is the type species of the genus, in its iron-rusted color, and having densely papillose costa covered with C-shaped papillae and quadrate, thin-walled, papillose lamina cells. These characters of this species agree well with those of *Bryoerythrophyllum recurvirostre* which is the type species of the genus *Bryoerythrophyllum*.

Bryoerythrophyllum Wallichii (Mitt.) Chen in Hedwigia **80**: 260 (1941).

NEPAL. Hile–Chirte, 2250 m (Jun. 5, 1972); Dor–Chauke, 2730 m (Jun. 7, 1972); Chauke–Lamo Pokhari, 2620 m (Jun. 8, 1972); Topke Gola–Shewaden, 3050 m (Jun. 28, 1972).

Distr. Endemic to Himalaya.

Gymnostomum aeruginosum Sm., Fl. Brit. **3**: 1163 (1804).

NEPAL. Basantapur–Dor, 2300–2600 m (Jun. 6, 1972).

Distr. Widely distributed in the Northern Hemisphere.

Gymnostomum recurvirostre Hedw.: Fl. E. Himal. 552 (1966); **2**: 243 (1971).

NEPAL. Topke Gola–Shewaden, 3500 m (Jun. 28, 1972).

Hyophila comosa Dix. et P. Vard. in Arch. Bot. **1**(8–9): 166 (1927).

NEPAL. Bir Gaon–Dingla, 1300 m (Jul. 1, 1972).

Distr. E. Himalaya (Nepal) and India. New to E. Himalaya.

There has not been known any gemma for this species. In our collection, there were many, greenish, star-formed gemmae on gemmifers sprouting from leaf-axils of the upper portion of stem, and the ventral surface of costa was almost smooth from leaf base to apex.

Hyophila involuta (Hook.) Jaeg.: Fl. E. Himal. 552 (1966).

NEPAL. Swayambhu temple, Kathmandu, 1500 m (May 28, 1972); Mohamabedi Khola–Tamur Bridge, 370 m (Jun. 3, 1972); Teku Nala–Dhankuta, 800–1300 m (Jun. 4, 1972); Kuwa Pani–Hile, 1860 m (Jun. 4, 1972); Papung–Bir Gaon, 1800 m (Jun. 30, 1972); Bir Gaon–Dingla, 1610 m (Jul. 1, 1972); Phulchoki, 2550 m (Jul. 15, 1972).

Leptodontium flexifolium (With.) Hampe in Lindb., Oefv. Foerh. Svensk. Vet. Ak. **21**: 227 (1864).

NEPAL. Gupha Pokhari–Suke, 2950 m (Jun. 10, 1972); Gosa–Banduke Pokhari, 4080 m (Jun. 14, 1972).

Distr. Widely distributed in the tropical to subtropical regions throughout the world, often extending to the warm temperate regions.

Leptodontium viticulosoides (P. Beauv.) Wijk et Marg. in Taxon **9**: 51 (1960).

L. squarrosum (Hook.) Par.: Fl. E. Himal. 553 (1966); **2**: 243 (1971).

NEPAL. Basantapur–Dor, 2450 m (Jun. 6, 1972); Dor–Chauke, 2650 m (Jun. 7, 1972); Chauke–Lamo Pokhari, 2580 m (Jun. 8, 1972).

Distr. Widely distributed in tropics.

Molendoa Hornschuchiana (Hook.) Lindb. ex Limpr., Laubm. Deutschl. **1**: 248 (1886).

NEPAL. Jalang Chhyongo, 4400 m (Jun. 21, 1972).

Distr. Europe, N. Africa, Himalaya (Nepal), and China. New to Himalaya.

Molendoa Sendtneriana (B.S.G.) Limpr., Laubm. Deutschl. **1**: 250 (1886).

Nepal. Phujeng La–Topke Gola, 3850 m (Jun. 27, 1972).

Distr. Europe, Himalaya, China, Formosa, Japan, Siberia, and Alaska.

Pseudosymblepharis angustata (Mitt.) Hilp.: Fl. E. Himal. **2**: 243 (1971).

Nepal. Chitre, 2350 m (Jul. 7, 1972).

Distr. Ceylon, Himalaya (Nepal to Bhutan), Thailand, Vietnam, Java, China, Formosa, and Japan.

Pseudosymblepharis subduriuscula (Wils.) Chen in Hedwigia **80**: 152 (1941).

Nepal. Chitre–Basantapur, 2350 m (Jun. 6, 1972).

Distr. Himalaya (Nepal), China, and Philippines.

Scopelophila cataractae (Mitt.) Broth. in Nat. Pfl. **1**: 436 (1902).

Merceya Gedeana (Lac.) Noguchi: Fl. E. Himal. 553 (1966).

Hyophila spathulata (Harv.) Jaeg. sensu Noguchi in Fl. E. Himal. 553 (1966).

Nepal. Sanguri Bhanjyang, 1200 m (Jun. 2, 1972); Chauke–Lamo Pokhari, 2620 m (Jun. 8, 1972); Janga La–Thudam, 3620 m (Jun. 21, 1972); Papung–Bir Gaon, 1950 m (Jun. 30, 1972); Nessum–Bhuje, 1350 m (Jul. 3, 1972).

Distr. Himalaya, India, Java, Philippines, Formosa, Japan, Korea, and S. America.

The previous report of *Hyophila spathulata* proved to be a misidentification. Both specimens (nich 236838, 236839) are revealed to be *Scopelophila cataractae* by the absence of ventral stereid band of costa in cross section and rounded to irregularly quadrate, nearly smooth, incrassate lamina cells.

Scopelophila ligulata (Spruce) Spruce in Journ. Bot., n. ser. **10**: 14 (1881), det. Iwatsuki.

Merceya ligulata (Spruce) Schimp.: Fl. E. Himal. 553 (1966).

Nepal. In a coniferous forest above Topke Gola, 3610 m, on rock (Jun. 18, 1972).

Distr. Europe, Azores, Caucasus, Himalaya, Java, China, Formosa, Japan, and America.

Semibarbula orientalis (Web.) Wijk et Marg. in Taxon **8**: 75 (1959).

Nepal. Teku Nala–Dhankuta, 1150 m (Jun. 4, 1972).

Distr. Widely distributed in the tropical to warm temperate regions of Asia and Africa.

Tortella tortuosa (Hedw.) Limpr., Laubm. Deutschl. **1**: 604 (1888).

Nepal. Topke Gola–Jalang Chhyongo, 3980 m (Jun. 20, 1972); Jalang Chhyongo–Janga La, 4510 m (Jun. 21, 1972).

Distr. Widely distributed in the Northern Hemisphere.

Trichostomum tenuirostre (Hook. et Tayl.) Lindb. in De Tort. 225 (1864).

T. cylindricum (Brid.) C. Muell.: Fl. E. Himal. 553 (1966).

Oxystegus cylindricus (Brid.) Hilp. in Beih. Bot. Centralbl. **50**: 620 (1933).

Nepal. Dhankuta–Nigale, 1550 m (Jun. 4, 1972); Hile–Chitre, 2350 m (Jun. 5, 1972).

Distr. Almost cosmopolitan.

GRIMMIACEAE (by Akira Noguchi)

Ptychomitrium Tortula (Harv.) Jaeg.: Fl. E. Himal. 553 (1966); **2**: 243 (1971).

Nepal. In a forest below Thudam, 3230 m, on rocks (Jun. 25, 1972); Topke Gola-Shewaden, 2850 m, on rocks (Jun. 28, 1972).

Racomitrium crispulum (Hook. f. et Wils.) Dix.: Fl. E. Himal. 554 (1966); **2**: 243 (1971).

Nepal. Basantapur–Dor, 2550 m, on rocks (Jun. 6, 1972); Dor–Chauke, 2650–2850 m, on rocks (Jun. 7, 1972); Chauke–Lamo Pokhari, 2580 m, on bank (Jun. 8, 1972); Hile Chok–Ghopte, 3400 m, on rocky cliff (Jun. 12, 1972); Ghopte–Gosa, 3700 m, on rocks (Jun. 13, 1972); around Banduke Pokhari, 4120 m, on rocks (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4200 m, on rocky cliff (Jun. 15, 1972); around Kipuphu, 4450 m, on rocks (Jun. 26, 1972); Kipuphu–Phujeng La, 4570 m, on rocks (Jun. 27, 1972); Phujeng La–Topke Gola, 3700 m, on rocky cliff (Jun. 27, 1972); in a forest near Chitre, 2350 m, on rocks (Jul. 7, 1972); Sim Chotala–Gram, 900–1900 m (Aug. 20, 1972); Thale Patil–Mangen, 3100–3400 m (Aug. 27, 1972).

Darjeeling. Sandakphu–Phalut, 3600 m (Aug. 2, 1972).

Racomitrium fasciculare (Hedw.) Brid., Mant. Musc. 80 (1819).

Nepal. Phujeng La–Topke Gola, 3700 m, on soil (Jun. 27, 1972).

Distr. Widely distributed in the Northern Hemisphere (including E. Himalaya), southern part of S. America, and New Zealand.

Racomitrium heterostichum var. **sudeticum** (Funck) Bauer in Musc. Eur. Am. Exs. **43**: n. 2019 (1931).

Nepal. Ghopte–Gosa, 3750 m, on rocks (Jun. 13, 1972); Janga La–Thudam, 4550 m, on rocks (Jun. 21, 1972).

Distr. Europe, Caucasus, E. Himalaya, Japan, and N. America.

ERPODIACEAE (by Zennoske Iwatsuki)

Aulacopilum abbreviatum Mitt. in Journ. Linn. Soc. Bot. **13**: 308 (1873).

Nepal. Bir Gaon–Dingla, 1300 m, on rocks (Jul. 1, 1972).

Distr. Himalaya, India, Indo-China, and China. New to E. Himalaya.

FUNARIACEAE (by Harumi Ochi)

Funaria hygrometrica Hedw.: Fl. E. Himal. 555 (1966).

Nepal. Hile Chok–Ghopte, 3350 m, on soil (Jun. 12, 1972).

SPLACHNACEAE (by Zennoske Iwatsuki and William C. Steere)

Tayloria Froelichiana (Hedw.) Mitt. in Broth. in Nat. Pfl. **1** (3): 502 (1903).

Nepal. Janga La–Thudam, 4580 m, on soil (Jun. 21, 1972); Kipuphu–Phujeng La, 4650 m, on soil (Jun. 27, 1972).

Distr. Europe, Caucasus, Himalaya, Greenland, and N. America. New to E. Himalaya.

This species has been reported from N. W. Himalaya. The above specimens extend the known range of this species to E. Himalaya.

Tayloria indica Mitt.: Fl. E. Himal. 555 (1966); **2**: 244 (1971).

Nepal. Shewaden–Papung, 2500 m, on rock (Jun. 29, 1972).

Distr. Ceylon, Himalaya, India, Burma, Thailand, and Philippines.

Previous expeditions brought back many specimens of *T. indica* Mitt. and its related species, *T. subglabra* (Griff.) Mitt. In spite of careful search, we found only one specimen of *T. indica* and none of *T. subglabra.* It might be caused by seasonal differences.

Tayloria splachnoides (Schwaegr.) Hook. in Journ. Sci. Arts **2**: 144 (1816).

NEPAL. Phujeng La–Topke Gola, 3700 m (Jun. 27, 1972, mixed with *Tayloria* sp., no. 1781); Topke Gola–Shewaden, 3350 m, on rock (Jun. 28, 1972, no 1831).

Distr. Europe, E. Himalaya, Japan, and N. America. New to Himalaya.

One specimen (no. 1831) was found on rock in a forest below Topke Gola, 3700 m alt., while the other specimen (no. 1781) was growing on the stone wall of a small shrine (gompa) mixed with another species of *Tayloria.*

In addition to the species mentioned above, we have two or three possible new species of *Tayloria.* These will be described elsewhere in the near future.

Tetraplodon angustatus (Hedw.) B.S.G.: Fl. E. Himal. 555 (1966).

NEPAL. Topke Gola–Jalang Chhyongo, 3910 m, on dung (Jun. 20, 1972); Janga La–Thudam, 4050 m, on dung (Jun. 21, 1972).

Distr. Europe, Himalaya, China, Japan, Siberia, and N. America.

Tetraplodon mnioides (Hedw.) B.S.G.: Fl. E. Himal. **2**: 244 (1971).

NEPAL. Banduke Pokhari–Saju Pokhari, 4150 m, on dung (Jun. 15, 1972, nos. 1129, 1161); Saju Pokhari–pass to Topke Gola, 4230–4300 m, on dung (Jun. 16, 1972, nos. 816, 817, 818, 819*, 820*, 821, 824, 825*, 834*, 835*); above Topke Gola, 3610 m, on dung (Jun. 18, 1972, no. 1312); Topke Gola–Jalang Chhyongo, 3910 m, on dung (Jun. 20, 1972, no. 1365*); Jalang Chhyongo–Janga La, 4510–4550 m, on dung (Jun. 21, 1972, nos. 1402, 1411*); Lama Chungbu–Slesa, 4350 m, on dung (Jun. 24, 1972, no. 1601); Thudam–Kipuphu, 4110 m, on dung (Jun. 26, 1972, no. 1668); Phujeng La, 4800 m, on dung (Jun. 27, 1972, no. 1744*); Phujeng La–Topke Gola, 4300–3700 m, on dung (Jun. 27, 1972, nos. 1765, 1777*); Kipuphu–Phujeng La, 4750 m, on dung (Jun. 27, 1972, nos. 1715, 1718).

Distr. Europe, C. Africa, Borneo, New Guinea, E. Himalaya, China, Japan, Siberia, and N. & S. America.

This is the commonest species of the family in this area, and shows much variation in size of plants, length of setae, etc. It usually grows on yak dung above 3600 m alt. *Tetraplodon urceolatus* (Brid.) B.S.G. was reported previously from Sikkim and E. Nepal. However, we consider it as an environmental form. Specimen number with an asterisk (*) in the above localities indicates this form.

BRYACEAE (by Harumi Ochi)

Brachymenium acuminatum Harv.: Fl. E. Himal. 555 (1966).

NEPAL. Nessum–Bhuje, 1550 m, on soil bank (Jul. 3, 1972).

Distr. Tropical to subtropical regions of Africa, Asia, Australia, and Ecuador; at lower altitudes.

Brachymenium exile (Doz. et Molk.) Bosch et Lac., Bryol. Jav. **1**: 139 (1860).

NEPAL. Nessum–Bhuje, 1550 m, on soil bank (Jul. 3, 1972).

Distr. Tropical to warm-temperate regions of Africa, Asia, and Hawaii; at lower altitudes.

Brachymenium nepalense Hook.: Fl. E. Himal. 556 (1966); **2**: 244 (1971)- Ochi in Journ. Fac. Educ. Tottori Univ. Nat. Sci. **23**: 32 (1972).

NEPAL. Suke, 2900 m, on tree-trunk (Jun. 10, 1972).

Distr. Tropical C. Africa, Madagascar, Mauritius I., S. to S. E. Asia, New Guinea, Japan, and Rossica I. near Vladivostoc.

Bryum algovicum Sendtn. ex C. Muell., Syn. Musc. **2**: 569 (1851)-Crundw. in Trans. Brit. Bryol. Soc. **6**: 137 (1970)-Crum, Steere et Anders. in Bryologist **76**: 92 (1973).

B. pendulum (Hornsch.) Schimp. in Coroll. 70 (1856), nom. illeg.; non Oeder ex Brid. (1803).

B. angustirete Kindb. in Macoun in Bull. Torr. Bot. Cl. **16**: 94 (1889).

NEPAL. Topke Gola-Jalang Chhyongo, 3910 m (Jun. 20, 1972); Phujeng La-Topke Gola, 3700 m (Jun. 27, 1972).

Distr. Higher latitudes or altitudes of the Northern and Southern Hemispheres.

Bryum argenteum Hedw., Sp. Musc. 181 (1801).

NEPAL. Chauke-Lamo Pokhari, 2850 m (Jun. 8, 1972); Hile Chok-Ghopte, 3450 m (Jun. 12, 1972); Ghopte-Gosa, 3800 m (Jun. 13, 1972); Banduke Pokhari-Saju Pokhari, 4150 m (Jun. 15, 1972); Saju Pokhari-pass to Topke Gola, 4200 m (Jun. 16, 1972); in *Rhododendron* forest above Topke Gola, 3610 m (Jun. 18, 1972); Topke Gola-Jalang Chhyongo, 4000 m (Jun. 20, 1972); in forest below Thudam, 3250 m (Jun. 25, 1972); Topke Gola-Shewaden, 3350 m (Jun. 28, 1972); Bir Gaon-Dingla, 1300 m (Jul. 1, 1972).

Distr. Cosmopolitan.

Bryum (Subgen. Anomobryum) **auratum** Mitt.: Fl. E. Himal. 557 (1966)-Ochi, l.c. **23**: 38 (1972).

NEPAL. Dor-Chauke, 2730 m, on rock (Jun. 7, 1972); Chauke-Lamo Pokhari, 2620 m, on rocky cliff (Jun. 8, 1972); Shewaden-Papung, 2150 m (Jun. 29, 1972); Papung-Bir Gaon, 1750-2050 m, on rocks (Jun. 30, 1972).

Distr. S. to S. E. Asia and Africa.

Bryum cf. **Billardieri** Schwaegr.: Fl. E. Himal. **2**: 244 (1971)-Ochi in Bryologist **74**: 505 (1972).

B. truncorum (Brid.) Brid. sensu Ochi in Fl. E. Himal. 558 (1966).

NEPAL. Chauke-Dor, 2600 m, on humus (Jul. 6, 1972).

Distr. Pan-tropical, and also extending up or down to warm-temperate regions of Northern and Southern Hemispheres; at lower altitudes.

Bryum blandum subsp. **Handelii** (Broth.) Ochi in Journ. Jap. Bot. **43**: 482, f. 2 (1968).

NEPAL. Banduke Pokhari-Saju Pokhari, 4150 m, on rock (Jun. 15, 1972).

Distr. E. Himalaya, China (prov. Yunnan), Formosa, and Japan. New to E. Himalaya.

Bryum capillare Hedw.: Fl. E. Himal. 557 (1966); **2**: 244 (1971).

NEPAL. Lamo Pokhari-Gupha Pokhari, 2830 m, on rock (Jun. 10, 1972); Phulchoki, summit area, 2550 m, on soil bank (Jul. 15, 1972).

Bryum (Subgen. Anomobryum) **filiforme** Dicks.

var. **concinnatum** (Spr.) Boul.: Fl. E. Himal. 558 (1966).

NEPAL. Suke, 2900 m, on tree-trunk (Jun. 10, 1972, + *Brachymenium nepalense*).

Bryum (Subgen. Rhodobryum) **giganteum** (Schwaegr.) Arnott: Fl. E. Himal. 558 (1966)-Ochi in Journ. Fac. Educ. Tottori Univ. Nat. Sci. **23**: 118 (1972).

NEPAL. below Lamo Pokhari, in mossy forest, 2700 m (Jun. 9, 1972); Nessum-Bhuje, 1850 m, on soil bank (Jul. 3, 1972).

Distr. S. Africa, Madagascar S. to S. E. Asia, Japan, and Hawaii; at lower altitudes.

Bryum (Subgen. Rhodobryum) **laxe-limbatum** Hamp. ex Ochi: Fl. E. Himal. **2**: 244 (1971).

Nepal. Basantapur–Dor, 2510–2550 m, on humus (Jun. 6, 1972); Topke Gola–Shewaden, 2600 m, on humus (Jun. 28, 1972); Shewaden–Papung, 2500 m, on humus (Jun. 29, 1972); Nessum–Bhuje, 2500–2600 m, on soil or humus (Jul. 3, 1972); Chauke–Dor, 2600 m, on soil bank (Jul. 6, 1972).

Bryum nitens Hook. in Icon. Pl. **1**: 19, f. 6 (1836)–Ochi in Journ. Jap. Bot. **45**: 22, f. 47 (1970); in Journ. Fac. Educ. Tottori Univ. Nat. Sci. **21**: 34 (1970); **23** (1): 62 (1972).

B. plumosum Doz. et Molk.: Fl. E. Himal. 558 (1966).

Nepal. Mohamabedi Khola–Tamur Bridge, 370 m, on rock (Jun. 3, 1972); Dingla–Doban, 800 m, on soil (Jul. 2, 1972).

Distr. Tropical and subtropical regions of S. to S. E. Asia, Australia, Africa, and Pacific islands; at lower altitudes.

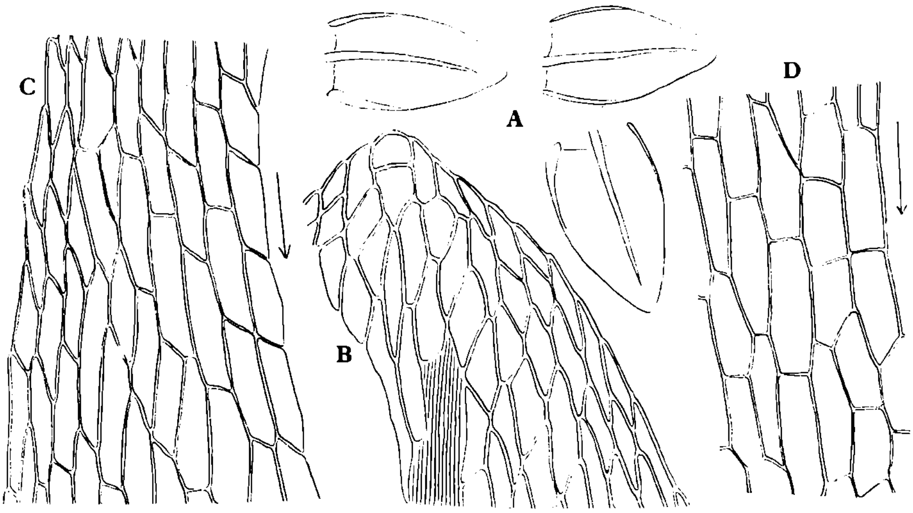

Fig. 33. *Bryum pellucidum* (Dix. et Badhw.) Ochi. A. Leaves, ×28, B. Leaf apex, ×250, C. Lamina-cells in the median-marginal portion, ×250, D. Ditto in the basal portion along costa, ×250. Drawn from holotype (bm).

Bryum (Subgen. Anomobryum) **pellucidum** (Dix. et Badhw.) Ochi in Journ. Hattori Bot. Lab. **35**: 67 (1972). [Fig. 33]

Anomobryum pellucidum Dix. et Badhw. in Rec. Bot. Surv. India **12**: 173 (1938).

Nepal. Kipuphu–Phujeng La, 4650 m, on soil (Jun. 27, 1972).

Distr. Himalaya. New to E. Himalaya.

This species was described on the basis of sterile material from N. W. Himalaya, at 15500 ft., and has not yet been recorded from any other localities. This thus is a new record from E. Himalaya for this moss.

Very densely tufted, slender stems, which are occasionally branched by subfloral innovations, very small (up to 0.8×0.45 mm) leaves having an obtuse, rounded apex, costa ceasing below the apex, a very lax areolation consisting of thin-walled, very broad, relatively short cells, etc. are remarkable characteristics of this species.

In *B. Yasudae* (Broth.) Ochi, the leaves are also obtuse and have a lax areolation. But plants are far robuster, and the leaves larger (up to 1.7×1 mm) and having a far stronger, percurrent costa. In *B. auratum* Mitt., the leaves also have an obtuse apex occasionally and the costa ceasing below or far below the apex. But the lamina-cells are linear-vermicular in the median to upper portions in this species.

B. pellucidum has not yet been illustrated adequately before.

Bryum pseudotriquetrum (Hedw.) Gaertn. in Meyer et Scherb., Oek. Techn. Fl. Wetterau **3**: 102 (1802): Fl. E. Himal. **2**: 245 (1971), ut *B. pseudotriquetrum* (Hedw.) Schwaegr.

NEPAL. Topke Gola, in coniferous forest, 3610 m, on soil (Jun. 18, 1972); Topke Gola-Jalang Chhyongo, 4000 m, on soil (Jun. 20, 1972); Thudam-Lama Chungbu, 3850 m, on soil (Jun. 23, 1972).

Distr. Widespread in the Northern and Southern Hemispheres.

Bryum recurvulum Mitt.: Fl. E. Himal. 558 (1966); **2**: 245 (1971).

NEPAL. Topke Gola-Jalang Chhyongo, 3980 m, on rock (Jun. 20, 1972); Topke Gola-Shewaden, 3500 m, on soil covering rocks (Jun. 28, 1972).

Bryum reflexifolium (Ochi) Ochi, stat. nov.

B. pseudo-alpinum var. *reflexifolium* Ochi in Journ. Jap. Bot. **39**: 52, f. 10 (1964).

B. teretiusculum var. *reflexifolium* (Ochi) Ochi in Fl. E. Himal. 558 (1966).

B. paradoxum var. *reflexifolium* (Ochi) Ochi in Hikobia **5**: 158 (1969).

NEPAL. Basantapur-Dor, 2350 m, on soil (Jun. 6, 1972); in mossy forest below Lamo Pokhari, 2850 m, on soil (Jun. 9, 1972); Suke-Hile Chok, 3000 m, on rocky cliff (Jun. 11, 1972); Topke Gola, 3600 m, on soil (Jun. 28, 1972); Bhuje-Gupha Pokhari, 2700 m (Jul. 4, 1972).

Distr. E. Himalaya.

Since *B. pseudo-alpinum* var. *reflexifolium* was proposed, many additional specimens, including the above cited ones, have been available for study. After studying them in detail, I have recently come to consider that it may be better to treat this variety as a distinct species, emphasizing the following respects distinguishable from *B. paradoxum*: Plants more spread in style when individuals are moistened, the leaves softer, broader and having a gradually narrowed base (scarcely or abruptly narrowed in *B. paradoxum*), always reflexed or even plane margins (mostly revolute strongly throughout in *B. paradoxum*) and laxer areolation.

Bryum salakense Card.: Fl. E. Himal. **2**: 245 (1971).

NEPAL. Hile-Chitre, 2250 m, on rock (Jun. 5, 1972); Dor-Chauke, 2750 m, on rock (Jun. 7, 1972); Ghopte-Gosa, 3650 m, on humus (Jun. 13, 1972); Shewaden-Papung, 2400 m, on rock (Jun. 29, 1972); Chitre, in forest, 2350 m, on tree-trunk (Jul. 7, 1972); Phulchoki, summit area, 2400 m, on rocky cliff (Jul. 15, 1972).

Distr. Nepal, Bhutan, Java, and Formosa.

Bryum (Subgen. Anomobryum) **Yasudae** (Broth.) Ochi in Rev. Bryaceae Japan 97 (1959); in Act. Phytotax. Geobot. **20**: 145 (1962).

NEPAL. Dhankuta-Nigale, 1350 m, on rock in stream (Jun. 4, 1972).

Distr. E. Himalaya, China (Shensi), Formosa, and Japan. New to E.

Himalaya.

The above cited specimen consists of sterile, slenderer stems. But it well represents respects of this species.

Mielichhoferia cf. **Sasaokae** Broth. in Oef. F. Vet.-Soc. Foerh. **62A**: 15 (1921)-Ochi, l.c. **19**: 25 (1968).

NEPAL. Janga La–Thudam, 4580 m, in crevices of rock (Jun. 21, 1972); Phujeng La–Topke Gola, 3700 m, in crevices of rocky cliff (Jun. 27, 1972).

Distr. W. Pakistan, N. W. to E. Himalaya, and Japan. New to E. Himalaya.

Plagiobryum Giraldii (C. Muell.) Par., Ind. Bryol. 957 (1897). [Fig. 34]

Bryum Giraldii C. Muell. in Nuov. Giorn. Bot. Ital. n. ser. **3**: 94 (1896).

P. Zierii var. *longicollum* C. Muell., l.c. **5**: 166 (1898), syn. nov.

NEPAL. Ghopte–Gosa, 3950 m, on soil (Jun. 13, 1972); around Banduke Pokhari, 4120 m, on soil or rock (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4150 m, on rocky cliff (Jun. 15, 1972).

Distr. E. Himalaya and China (Shensi). New to E. Himalaya.

This species is similar to *P. Zierii*. But, in *P. Giraldii*, the stem-leaves are harder, more fragile, with the costa regularly short-excurrent denser areolation consisting of thicker-walled cells, and the longer-clavate capsules have a longer neck, which is not much slenderer than the theca.

It is difficult to recognize any constant differences between *P. Giraldii* and *P. Zierii* var. *longicollum* except for the longer-clavate capsules in the latter. *P. Zierii* var. *longicollum* seems merely a modification of *P. Giraldii.*

The present species has not yet been illustrated adequately before.

Pohlia acuminata Hopp. et Hornsch.: Fl. E. Himal. 559 (1966); **2**: 245 (1971).

NEPAL. Topke Gola–Jalang Chhyongo, 4130 m, on soil (Jun. 20, 1972); Kipuphu–Phujeng La, 4570 m, on soil (Jun. 27, 1972).

Distr. Higher latitudes or altitudes in the Northern Hemisphere.

Pohlia crudoides var. **revolvens** (Card.) Ochi, Rev. Bryaceae Japan 13, f. 3 (1959); in Misc. Bryol. Lichenol. **3**: 118 (1964).

NEAPL. Gosa–Banduke Pokhari, 4210 m, in crevices of rocky cliff (Jun. 14, 1972).

Distr. E. Himalaya, Formosa, and Japan; at higher altitudes. New to E. Himalaya.

Pohlia elongata Hedw.: Fl. E. Himal. 559 (1966); **2**: 245 (1971).

NEPAL. Basantapur–Dor, 2510 m (Jun. 6, 1972); Dor–Chauke, 2650–2850 m (Jun. 7, 1972); Chauke–Lamo Pokhari, 2620–2680 m (Jun. 8, 1972); in mossy forest below Lamo Pokhari, 2850 m (Jun. 9, 1972); Suke–Hile Chok, 3350 m (Jun. 11, 1972); Gosa–Banduke Pokhari, 4080 m (Jun. 14, 1972); Topke Gola, in coniferous forest, 3610 m (Jun. 18, 1972); in forest below Thudam, 3350 m (Jun. 22, 1972); Gosainkund–Gopte, 3500–4400 m (Aug. 25, 1972); Gopte–Thale Patil, 3200–3500 m (Aug. 26, 1972).

Distr. Widespread in the Northern Hemisphere and Africa.

Pohlia leucostoma (Bosch et Lac.) Fleisch., Musci Fl. Buit. **2**: 514 (1904); Ochi, l.c. **19**: 28, f. 3 (1968).

NEAPL. Near Chitre, in forest, 2350 m, on soil bank (Jul. 7, 1972).

Distr. India, Nepal, Indonesia, Japan, and Hawaii.

Pohlia longicolla (Hedw.) Lindb.: Fl. E. Himal. 559 (1966); **2**: 245 (1971).

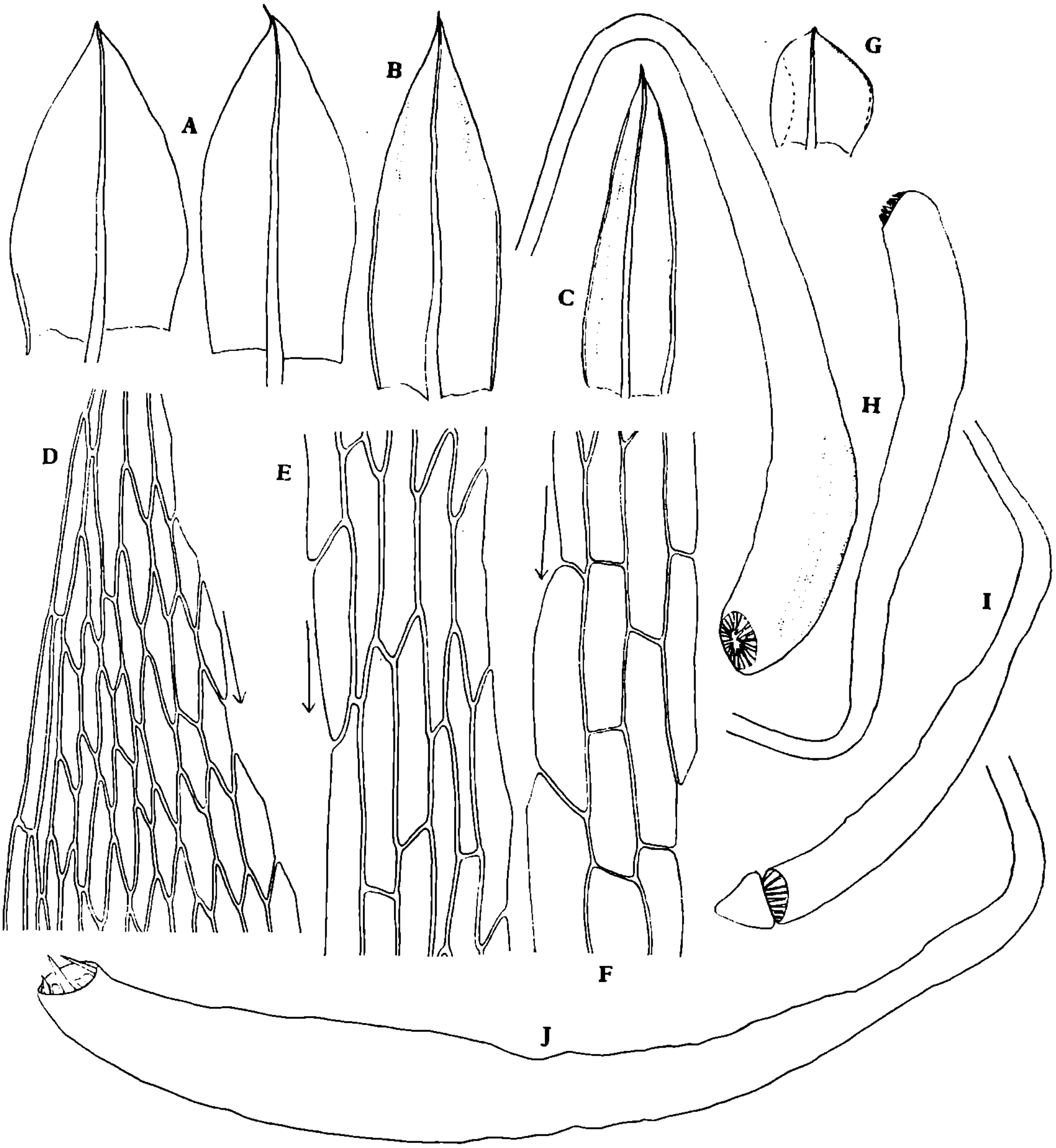

Fig. 34. *Plagiobryum Giraldii* (C. Muell.) Par. A & B. Stem-leaves, ×28, C. Perichaetial leaf, ×28, D. Upper margin of leaf, ×250, E. Lamina-cells in the median portion, ×250, F. Ditto in the basal portion, ×250, G. Innovation leaf, ×28, H, I & J. Capsules, ×14. A–H drawn from isotype of *P. Giraldii* (PC), and I & J. from isotype of *P. Zierii* var. *longicollum* (PC).

NEPAL. Chitre–Basantapur, 2350 m, on soil (Jun. 6, 1972); below Lamo Pokhari, in mossy forest, 2730 m, on rock (Jun. 9, 1972); Gupha Pokhari–Suke, 2950 m, on soil (Jun. 10, 1972); Suke–Hile Chok, 3000 m, on soil (Jun. 11, 1972); Hile Chok–Gopte, 3350 m, on soil (Jun. 12, 1972); Topke Gola–Jalang Chhyongo, 3750 m, on soil (Jun. 20, 1972); Jalang Chhyongo–Janga La, 4510 m (Jun. 21, 1972); Topke Gola–Shewaden, 3150 m, on rock (Jun. 28, 1972).

Pohlia nutans (Hedw.) Lindb., Musc. Scand. 18 (1879).

NEPAL. Banduke Pokhari–Saju Pokhari, 4150 m, on soil (Jun. 15, 1972); above Topke Gola, in forest, 3610 m, on rotten log or soil (Jun. 18, 1972); Lama Chungbu–

Slesa, 4350 m, on soil (Jun. 24, 1972); around Phujeng La, 4800 m, in crevices of rock (Jun. 27, 1972); Gosainkund-Gopte, 3500–4400 m (Aug. 25, 1972).

Distr. Antipodal.

Pohlia proligera (Kindb.) Broth. in Nat. Pfl. **1** (3): 551, f. 421 E–K (1903)–Ochi, l.c. **19**: 31 (1968).

NEPAL. Around Kipuphu, 4500 m, on soil (Jun. 26, 1972).

Distr. At higher altitudes or latitudes in the Northern Hemisphere. New to E. Himalaya.

Pohlia Wahlenbergii (Web. et Mohr) Andrews in Grout, Moss Fl. N. Am. **2**: 203 (1935).

NEPAL. Papung–Bir Gaon, 1850–2050 m, on rock (Jun. 30, 1972).

Distr. Antipodal.

MNIACEAE (by Akira Noguchi)

Mnium cf. **heterophyllum** (Hook.) Schwaegr.: Fl. E. Himal. **2**: 245 (1971).

NEPAL. Gosa–Banduke Pokhari, 4050 m, on humus (Jun. 14, 1972); in a coniferous forest above Topke Gola, 3610 m, on soil (Jun. 18, 1972).

Mnium lycopodioides Schwaegr.: Fl. E. Himal. 561 (1966).

NEPAL. Hile–Chitre, 2350 m, on rocks (Jun. 5, 1972); Chauke–Lamo Pokhari, 2680 m, on rocks (Jun. 8, 1972); Saju Pokhari-pass to Topke Gola, 4230 m, on rocky cliff (Jun. 16, 1972); Jalang Chhyongo–Janga La, 4510 m, on soil (Jun. 21, 1972); in forest below Thudam, 3350 m, on rocks (Jun. 22 & 25, 1972); Topke Gola–Shewaden, 2950 m, on rocks (Jun. 28, 1972); Shewaden–Papung, 2250–2500 m, on bank (Jun. 29, 1972).

Distr. Europe, India, Himalaya, China, Japan, and N. America.

Mnium orthorrhynchum Brid., Sp. Musc. **3**: 45 (1817).

NEPAL. Suke–Hile Chok, 2980 m, on rotten logs (Jun. 11, 1972).

Distr. Widely distributed in the Northern Hemisphere. New to E. Himalaya.

Orthomniopsis dilatata (Mitt.) Nog.: Fl. E. Himal. 563 (1966).

NEPAL. Papung–Bir Gaon, 1850 m, on rocks (Jun. 30, 1972); Bir Gaon–Dingla, 1300 m, on rocks (Jul. 1, 1972).

Orthomnium bryoides (Griff.) Wijk et Marg.: Fl. E. Himal. 563 (1966); **2**: 246 (1971).

NEPAL. Near Sanguri Bhanjyang, 1270 m, on rocks and fallen tree branches (Jun. 2, 1972); Dor–Chauke, 2850 m, on fallen tree branches (Jun. 7, 1972); Bir Gaon–Dingla, 1610 m, on rocks (Jul. 1, 1972); Nessum–Bhuje, 1900 m, on rocks (Jul. 3, 1972).

Orthomnium Loheri Broth. in Oefv. Finsk. Vet. Soc. Foerh. **47**: 6 (1905).

NEPAL. Shewaden–Papung, 2350 m, on fallen tree branches (Jun. 29, 1972); Bir Gaon–Dingla, 1150–1610 m, on rocks and tree trunks (Jul. 1, 1972).

Distr. Philippines and Himalaya. New to Himalaya.

Plagiomnium confertidens (Lindb. et Arn.) Kop. in Ann. Bot. Fenn. **5**: 146 (1968).

Mnium confertidens (Lindb. et Arn.) Kindb.: Fl. E. Himal. 559 (1966); **2**: 245 (1971).

NEPAL. Around Lamo Pokhari, 2900 m, on humus (Jun. 8, 1972); Lamo Pokhari–Gupha Pokhari, 2860 m, on humus (Jun. 10, 1972); Topke Gola–Shewaden, 3350 m, on bank (Jun. 28, 1972); Chauke–Dor, 2750 m, on bank (Jul. 6, 1972); Singum Gompa–Gosainkund, 3200–4200 m (Aug. 23, 1972).

Plagiomnium cuspidatum (Hedw.) Kop. in Ann. Bot. Fenn. **5**: 146 (1968).

Mnium cuspidatum Hedw.: Fl. E. Himal. **2**: 245 (1971).

NEPAL. Dor–Chauke, 2850 m, on rocks (Jun. 7, 1972).

Plagiomnium rostratum (Schrad.) Kop.

subsp. **rhynchophorum** (Hook.) Nog., stat. nov.

Mnium rhynchophorum Hook., Icon. Pl. **1**: 20, f. 3 (1836).

NEPAL. Hile–Chitre, 2250 m, on tree trunks (Jun. 5, 1972); Chitre–Basantapur, 2350 m, on rotten logs (Jun. 6, 1972); Dor–Chauke, 2850 m, on decaying logs (Jun. 7, 1972); Chauke–Lamo Pokhari, 2680 m, on rocks (Jun. 8, 1972); in a mossy forest below Lamo Pokhari, 2630 m (Jun. 9, 1972); Shewaden–Papung, 2500 m, on rocks (Jun. 29, 1972); Nessum–Bhuje, 2750 m, on rocks (Jul. 3, 1972).

Distr. Himalaya and Formosa.

subsp. **vesicatum** (Besch.) Nog., stat. nov.

Mnium vesicatum Besch. in Ann. Sci. Nat. sér. 7, Bot. **17**: 345 (1893): Fl. E. Himal. 563 (1966).

NEPAL. Hile–Chitre, 1990 m, on rocks (Jun. 5, 1972); Dor–Chauke, 2750 m, on humus (Jun. 7, 1972); loc. cit., 2600 m, on bank (Jul. 6, 1972); Janga La–Thudam, 3750 m, on bank (Jun. 21, 1972); in a forest below Thudam, 3350 m, on rocks (Jun. 22, 1972); Topke Gola–Shewaden, 2800 m, on rocks (Jun. 28, 1972); Shewaden–Papung, 2150–2500 m, on rocks and soil (Jun. 29, 1972); Nessum–Bhuje, 1800 m, on rocks (Jul. 3, 1972).

Plagiomnium succulentum (Mitt.) Kop. in Ann. Bot. Fenn. **5**: 147 (1968).

NEPAL. Bir Gaon–Dingla, 1350 m, on rocks (Jul. 1, 1972).

Distr. E. Himalaya, China, Formosa, and Japan.

Rhizomnium pseudopunctatum (Bruch et Sch.) Kop. in Ann. Bot. Fenn. **5**: 143 (1968).

Mnium pseudopunctatum Bruch et Sch.: Fl. E. Himal. 561 (1966).

NEPAL. Topke Gola–Shewaden, 2900–3400 m, on rocks and soil (Jun. 28, 1972).

Rhizomnium punctatum (Schreb. ex Hedw.) Kop.

subsp. **Horikawae** (Nog.) Nog., stat. nov.

Mnium Horikawae Nog. in Trans. Nat. Hist. Soc. **24**: 290 (1934).

M. punctatum var. *Horikawae* (Nog.) Nog. in Fl. E. Himal. 562 (1966); **2**: 246 (1971).

NEPAL. In a mossy forest below Lamo Pokhari, 2680 m, on tree trunks (Jun. 9, 1972); Hile Chok–Ghopte, 3350 m, on rocky cliff (Jun. 12, 1972); Gosa–Banduke Pokhari, 4050 m, on humus (Jun. 14, 1972); in a coniferous forest side of a pond near Topke Gola, 3600 m, on humus (Jun. 19, 1972).

AULACOMNIACEAE (by Zennoske Iwatsuki)

Aulacomnium palustre (Hedw.) Schwaegr., Sp. Musc. Suppl. **3** (1): 216 (1827).

NEPAL. Thudam–Lama Chungbu, 3850 m, on soil (Jun. 23, 1972); Lama Chungbu–Slesa, 4200 m, on humus (Jun. 24, 1972); Phujeng La–Topke Gola, 3700 m, on soil (Jun. 27, 1972).

Distr. Almost cosmopolitan.

BARTRAMIACEAE (by Harumi Ochi)

Bartramia cf. **ithyphylla** Brid.: Fl. E. Himal. 566 (1966); **2**: 246 (1971).

NEPAL. Around Banduke Pokhari, 4120 m, in crevices of rocky cliff (Jun. 14, 1972).

Distr. At higher latitudes or altitudes in the Northern Hemisphere.

Bartramidula Roylei (Hook. f.) B.S.G., Bryol. Eur. **4**: 55 (1846)-Ochi in Nova Hedwigia **5**: 114, pl. 15 M-N (1963).

NEPAL. Along pass to Sanguri Bhanjyang, 600 m, on soil (Jun. 2, 1972); Phulchoki, summit area, 2400-2600 m, on rock or soil (Jul. 15, 1972).

Distr. Ceylon, India, N. to E. Himalaya, China (Yunnan), Philippines, and Formosa; at lower altitudes. New to E. Himalaya.

Fleischerobryum longicolle (Hamp.) Loesk.: Fl. E. Himal. 566 (1966).

NEPAL. Bir Gaon-Dingla, 1050 m, on rocky cliff (Jul. 1, 1972).

Philonotis falcata (Hook. f.) Mitt.: Fl. E. Himal. **2**: 246 (1971).

NEPAL. Hile-Chitre, 2150 m, on soil (Jun. 5, 1972).

Philonotis fontana (Hedw.) Brid., Bryol. Univ. **2**: 18 (1827).

NEPAL. Above Topke Gola, in forest, 3600 m, on soil (Jun. 18, 1972); Lama Chungbu-Thudam, 4050 m, on soil (Jun. 24, 1972); Topke Gola, 3600 m, on soil (Jun. 28, 1972, +*Bryum reflexifolium*); Topke Gola-Shewaden, 3300 m, on soil (Jun. 28, 1972).

Distr. At higher latitudes or altitudes of the Northern Hemisphere, S. America, and N. to C. Africa.

var. **seriata** (Mitt.) Kindb.: Fl. E. Himal. 566 (1966).

NEPAL. Gosainkund-Gopte, 3500-4400 m (Aug. 25, 1972).

Distr. Europe, Greenland, Caucasus, C. Asia, Himalaya, Japan, Korea, Siberia, and N. America.

Philonotis lancifolia Mitt. in Journ. Linn. Soc. **8**: 151 (1864)-Ochi in Nova Hedwigia **5**: 94 (1963); in Hikobia **5**: 35 (1967).

NEPAL. Bir Gaon-Dingla, 1350 m, on rock (Jul. 1, 1972).

Distr. E. Himalaya, Sumatra, China, Korea, and Japan; at lower altitudes. New to E. Himalaya.

Philonotis Turneriana (Schwaegr.) Mitt.: Fl. E. Himal. 566 (1966).

NEPAL. Hile-Chitre, 2300 m, on soil (Jun. 5, 1972).

ORTHOTRICHACEAE (by Akira Noguchi)

Macromitrium consanguineum Card. in Beih. Bot. Centralbl. **17**: 11 (1904).

NEPAL. Suke-Hile Chok, 3550 m, on tree trunks (Jun. 11, 1972); in a coniferous forest side of a pond near Topke Gola, 3600 m, on tree trunks (Jun. 19, 1972).

Distr. E. Himalaya, Formosa, Korea, and Japan.

RHACOPILACEAE (by Akira Noguchi)

Rhacopilum cuspidigerum (Schwaegr.) Aongstr. in Oefv. K. Vet. Ak. Foerh. **29**: 10 (1872).

NEPAL. Papung-Bir Gaon, 1900 m, on rocks (Jun. 30, 1972); Bir Gaon-Dingla, 1350 m, on rocks (Jul. 1, 1972); around Sanguri Bhanjyang, 1050 m, on tree trunks (Jul. 10, 1972).

Distr. E. Himalaya, Indo-China, Indonesia, Oceania, and southern part of S.

America. New to Himalaya.

HEDWIGIACEAE (by Akira Noguchi)

Bryowijkia ambigua (Hook.) Nog. in Journ. Hattori Bot. Lab. **37**: 241 (1973). *Cleistostoma ambiguum* (Hook.) Brid.: Fl. E. Himal. 566 (1966).

NEPAL. Hile–Chitre, 2150 m, on rocks (Jun. 5, 1972); Papung–Bir Gaon, 2050 m, on tree trunks (Jun. 30, 1972); in a forest near Chitre, 2350 m, on branches of tree (Jul. 7, 1972).

CRYPHAEACEAE (by Zennoske Iwatsuki)

Acrocryphaea concavifolia (Griff.) Bosch et Lac.: Fl. E. Himal. 567 (1966); **2**: 247 (1971).

NEPAL. In a *Shorea* forest, south of Dharan, 200–240 m, on fallen tree branches (Jun. 1, 1972); Basantapur–Dor, 2370 m, on tree branches (Jun. 6, 1972); Papung–Bir Gaon, 1800 m, on tree trunks (Jun. 30, 1972); Bir Gaon–Dingla, 1100 m, on tree trunks (Jul. 1, 1972).

Distr. Ceylon, India, Himalaya, Indo-China, Indonesia, New Guinea, and Philippines.

Sphaerotheciella sphaerocarpa (Hook.) Fleisch.: Fl. E. Himal. 567 (1966); **2**: 247 (1971).

NEPAL. Dor–Chauke, 2850 m, on tree trunks (Jun. 7, 1972); in a mossy forest below Lamo Pokhari, 2850 m, on fallen tree branches (Jun. 9, 1972); Suke, 2900 m, on tree branches (Jun. 10, 1972); in a forest below Thudam, 3400 m, on tree branches (Jun. 22, 1972).

TRACHYPODACEAE (by Akira Noguchi)

Diaphanodon blandus (Harv.) Ren. et Card.: Fl. E. Himal. 567 (1966); **2**: 248 (1971).

NEPAL. Chitre–Basantapur, 2350 m, on tree branches (Jun. 6, 1972); Basantapur–Dor, 2100–2550 m, on tree branches (Jun. 6, 1972); in a mossy forest below Lamo Pokhari, 2700 m (Jun. 9, 1972); Suke, 2900 m, on tree branches (Jun. 10, 1972, + *Thuidium brachymenium*); Topke Gola–Shewaden, 3000 m, on rocks (Jun. 28, 1972); Phulchoki, 2100 m, on tree branches (Jul. 15, 1972, + *Meteoriopsis squarrosa*).

Distr. Tropical Asia, north to Himalaya.

Duthiella flaccida (Card.) Broth. in Nat. Pfl. **1** (3): 1010 (1908), det. Iwatsuki.

NEPAL. Bir Gaon–Dingla, 1050 m, on rocks (Jul. 1, 1972); Phulchoki, 2100 m, on soil (Jul. 15, 1972).

Distr. India, E. Himalaya, N. Vietnam, China, Philippines, Borneo, New Guinea, Formosa, and Japan. New to Himalaya.

Trachypodopsis auriculata (Mitt.) Fleisch.: Fl. E. Himal. 568 (1966).

NEPAL. Chauke–Lamo Pokhari, 2580 m, on bank (Jun. 8, 1972); Topke Gola–Shewaden, 2850 m, on rocks (Jun. 28, 1972).

Trachypodopsis serrulata Fleisch.

var. **crispatula** (Hook.) Zant.: Fl. E. Himal. 568 (1966); **2**: 248 (1971).

NEPAL. Hile–Chitre, 2100–2300 m, on tree trunks, soil, and rock (Jun. 5, 1972); Chitre–Basantapur, 2350 m, on tree trunks (Jun. 6, 1972, + *Neckera himalayana*); Dor–

Chauke, 2850 m, on rocks (Jun. 7, 1972); Bir Gaon–Dingla, 1300 m, on rocks (Jul. 1, 1972); in a forest near Chitre, 2350 m, on tree trunks (Jul. 7, 1972); around Sanguri Bhanjyang 1300 m, on tree trunks (Jul. 10, 1972); Phulchoki, 1200 m (Jul. 15, 1972, +*Meteoriopsis squarrosa*).

var. **Guibertii** (Thér. et P. de la Vard.) Zant.: Fl. E. Himal. 569 (1966); **2**: 248 (1971).

NEPAL. Basantapur–Dor, 2550 m, on rocky cliff (Jun. 6, 1972); Dor–Chauke, 2850 m, on tree roots (Jun. 7, 1972, +*Trachypus bicolor*).

Distr. Himalaya, Indo-China, and Borneo.

Trachypus bicolor Reinw. et Hornsch.: Fl. E. Himal. 569 (1966).

NEPAL. Hile–Chitre, 2350 m, on rocks (Jun. 5, 1972); Chitre–Basantapur, 2350 m, on tree trunks (Jun. 6, 1972); Dor–Chauke, 2850 m, on tree roots (Jun. 7, 1972); Chauke–Lamo Pokhari, 2850 m, on tree trunks and rocks (Jun. 8, 1972); Lamo Pokhari–Gupha Pokhari, 2830 m, on soil (Jun. 10, 1972); Ghopte–Gosa, 3700 m, on rocks (Jun. 13, 1972); on a slope above Jalang Chhyongo, 4400 m, in crevice of cliff (Jun. 21, 1972); Lama Chungbu–Slesa, 4180 m, on rocks (Jun. 24, 1972); Papung–Bir Gaon, 2050 m, on rocks (Jun. 30, 1972); Bir Gaon–Dingla, 1300 m, on rocks (Jul. 1, 1972); Chauke–Dor, 2600 m, on rocks (Jul. 6, 1972); Dor–Chitre, 2500 m, on tree trunks (Jul. 7, 1972, +*Neckera himalayana*).

PTEROBRYACEAE (by Akira Noguchi)

Calyptothecium Hookeri (Mitt.) Broth.: Fl. E. Himal. 569 (1966); **2**: 248 (1971), det. Iwatsuki.

NEPAL. Chitre–Basantapur, 2350 m, on tree trunks (Jun. 6, 1972); in a mossy forest below Lamo Pokhari, 2700 m, on tree branches (Jun. 9, 1972, +*Floribundaria sparsa, Diaphanodon blandus*); Shewaden–Papung, 2350 m (Jun. 29, 1972).

Calyptothecium pinnatum Nog.: Fl. E. Himal. 565 (1966).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on tree trunks (Jun. 2, 1972); Hile–Chitre, 2250 m, on tree trunks (Jun. 5, 1972, +*Penzigiella cordata*); Basantapur–Dor, 2300 m, on tree trunks (Jun. 6, 1972, +*Meteoriopsis squarrosa*, *Trachypodopsis serrulata* var. *crispatula*).

Distr. E. Himalaya (Nepal, Sikkim), Khasia, Burma, and Formosa.

Penzigiella cordata (Harv. et Hook.) Fleisch.: Fl. E. Himal. 570 (1966); **2**: 248 (1971).

NEPAL. Hile–Chitre, 2250 m, on tree trunks (Jun. 5, 1972); Chitre–Basantapur, 2300–2400 m, on tree trunks (Jun. 6, 1972).

Pterobryopsis acuminata (Hook.) Fleisch. in Hedwigia **45**: 59 (1905).

NEPAL. Chitre–Basantapur, 2350 m, on tree trunks (Jun. 6, 1972); Chauke–Lamo Pokhari, 2620 m, on tree trunks (Jun. 8, 1972); Papung–Bir Gaon, 2050 m, on tree trunks (Jun. 30, 1972); Dor–Chitre, 2350 m, on tree branches (Jul. 7, 1972).

Distr. E. Himalaya (Nepal, Sikkim), Khasia, and Formosa.

Pterobryopsis auriculata Dix. in Journ. Bombay Nat. Hist. Soc. **39**: 782 (1937).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on tree trunks (Jun. 2, 1972).

Distr. E. Himalaya and Assam. New to Himalaya.

Pterobryopsis divergens (Mitt.) Nog.: Fl. E. Himal. 570 (1966).

NEPAL. Papung–Bir Gaon, 2050 m, on tree trunks (Jun. 30, 1972).

Distr. E. Himalaya (Nepal, Sikkim), Khasia, and Burma.

Pterobryopsis Foulkesiana (Mitt.) Fleisch.: Fl. E. Himal. 570 (1966).

NEPAL. Near Sanguri Bhanjyang, 1260 m, on tree trunks (Jun. 2, 1972); Nigale-Kuwa Pani, 1720 m, on tree trunks (Jun. 4, 1972).

Distr. E. Himalaya (Nepal, Sikkim) and Nilghiri.

METEORIACEAE (by Akira Noguchi)

Aerobryidium aureo-nitens (Schwaegr.) Broth. in Nat. Pfl. **1** (3): 820 (1906).

NEPAL. Near Sanguri Bhanjyang, 1270 m, on rocks (Jun. 2, 1972, +*Papillaria Feae*); Kuwa Pani-Hile, 1890 m, on rocks (Jun. 4, 1972); Hile-Chitre, 1990 m, on rocks (Jun. 5, 1972, +*Meteoriopsis squarrosa*, *Papillaria Feae*); Bir Gaon-Dingla, 1100-1300 m, on rocks and tree trunks (Jul. 1, 1972); Phulchoki, 1650 m, on tree trunks (Jul. 15, 1972).

Distr. Ceylon, India (including Khasia and Nilghiri), E. Himalaya (Nepal, Sikkim), Burma, and Indo-China.

Aerobryidium filamentosum (Hook.) Fleisch.: Fl. E. Himal. 570 (1966); **2**: 249 (1971).

NEPAL. Near Sanguri Bhanjyang, 1270 m, on rocks (Jun. 2, 1972); Hile-Chitre, 2350 m, on bush (Jun. 5, 1972); Chitre-Basantapur, 2350 m, on tree trunks (Jun. 6, 1972); Chauke-Lamo Pokhari, 2580 m, on tree trunks (Jun. 8, 1972), det. Iwatsuki; in a mossy forest below Lamo Pokhari, 2650 m, on fallen tree branches (Jun. 9, 1972), det. Iwatsuki; Lamo Pokhari-Gupha Pokhari, 2850 m, on rocks (Jun. 10, 1972), det. Iwatsuki; Shewaden-Papung, 2450 m, on tree branches (Jun. 29, 1972), det. Iwatsuki; Papung-Bir Gaon, 2050 m, on tree trunks (Jun. 30, 1972), det. Iwatsuki; Nessum-Bhuje, 1800 m, on rocks (Jul. 3, 1972), det. Iwatsuki; Gupha Pokhari-Chauke, 2600 m, on tree branches (Jul. 4, 1972), det. Iwatsuki; Dor, 2550 m, on fallen tree branches (Jul. 6, 1972, +*Floribundaria aurea*); in a forest near Chitre, 2350 m, on tree branches and rocks (Jul. 7, 1972); Phulchoki, 2400 m, on tree trunks and branches (Jul. 15, 1972), det. Iwatsuki.

Barbella enervis (Thw. et Mitt.) Fleisch. in Broth. in Nat. Pfl. **1** (3): 824 (1906).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on bush (Jun. 2, 1972).

Distr. Ceylon, Himalaya, Nilghiri, Philippines, Formosa, Japan, E. Australia, Lord Howe Isl., and New Caledonia.

Barbella Stevensii (Ren. et Card.) Fleisch.: Fl. E. Himal. 571 (1966).

NEPAL. Hile-Chitre, 2250 m, on bush (Jun. 5, 1972); in a mossy forest below Lamo Pokhari, 2850 m (Jun. 9, 1972).

Chrysocladium phaeum (Mitt.) Fleisch.: Fl. E. Himal. 572 (1966).

NEPAL. Dor-Chauke, 2850 m, on tree branches (Jun. 7, 1972); around Lamo Pokhari, 2900 m, on tree trunks (Jun. 8, 1972); in a mossy forest below Lamo Pokhari, 2700-2850 m, on tree branches (Jun. 9, 1972); Lamo Pokhari-Gupha Pokhari, 2830 m, on soil (Jun. 10, 1972); Suke, 2900 m, on tree branches (Jun. 10, 1972); Suke-Hile Chok, 3000 m (Jun. 11, 1972); Chauke-Dor, 2750 m, on tree branches (Jul. 6, 1972), det. Iwatsuki; Dor, 2550 m, on tree branches (Jul. 6, 1972); in a forest near Chitre, 2350 m, on tree branches (Jul. 7, 1972).

Floribundaria armata Broth. in Symb. Sin. **4**: 83 (1929).

NEPAL. Basantapur-Dor, 2300-2600 m, on tree branches (Jun. 6, 1972); in a forest below Thudam, 3400 m, on tree trunks (Jun. 22, 1972); Topke Gola-Shewaden, 3000 m, on tree trunks (Jun. 28, 1972); Dor, 2600 m, on tree branches (Jul. 6, 1972).

Distr. Himalaya and China (Yunnan). New to Himalaya.

Floribundaria aurea (Mitt.) Broth.: Fl. E. Himal. 572 (1966).

NEPAL. Dor–Chauke, 2850 m, on tree branches (Jun. 7, 1972); Bhuje–Gupha Pokhari, 2850 m, on soil (Jul. 4, 1972); Dor, 2550 m, on tree branches (Jul. 6, 1972, +*Aerobryidium filamentosum*).

Floribundaria floribunda (Doz. et Molk.) Fleisch.: Fl. E. Himal. 572 (1966); **2**: 249 (1971).

NEPAL. Near Sanguri Bhanjyang, 1250 m, on tree trunks (Jun. 2, 1972); Shewaden–Papung, 2500 m, on tree trunks and rocks (Jun. 29, 1972); Papung–Bir Gaon, 1800 m, on tree trunks (Jun. 30, 1972).

Floribundaria sparsa (Mitt.) Broth.: Fl. E. Himal. 572 (1966); **2**: 249 (1971).

NEPAL. In a mossy forest below Lamo Pokhari, 2700 m, on tree branches (Jun. 9, 1972); Shewaden–Papung, 2500 m, on tree branches (Jun. 29, 1972); in a forest near Chitre, 2350 m, on bank (Jul. 7, 1972); Phulchoki, 2100 m, on tree trunks (Jul. 15, 1972).

var. **pilifera** (Nog.) Nog.: Fl. E. Himal. 573 (1966); **2**: 249 (1971).

NEPAL. Kuwa Pani–Hile, 1890 m, on bush (Jun. 4, 1972); Hile–Chitre, 2150–2350m, on bush (Jun. 5, 1972); Chitre–Basantapur, 2350 m, on soil (Jun. 6, 1972); Dor–Chauke, 2600–2750 m, on tree branches (Jun. 7, 1972); in a forest near Chitre, 2350 m, on tree branches (Jul. 7, 1972).

Meteoriopsis ancistrodes (Ren. et Card.) Broth. in Nat. Pfl. **1** (3): 826 (1906).

NEPAL. Chauke–Dor, 2750 m, on tree branches (Jul. 6, 1972).

Distr. Tropical Asia.

Meteoriopsis formosana Nog. in Journ. Hattori Bot. Lab. **3**: 92 (1948).

NEPAL. Shewaden–Papung, 2050 m, on trees (Jun. 29, 1972); Bir Gaon–Dingla, 1300–1600 m, on rocks (Jul. 1, 1972); around Sanguri Bhanjyang, 1200 m, on rocks (Jul. 10, 1972, +*Papillaria Feae*).

Distr. E. Himalaya and Formosa. New to Himalaya.

Meteoriopsis reclinata (C. Muell.) Fleisch.: Fl. E. Himal. 573 (1966); **2**: 249 (1971), det. Iwatsuki.

NEPAL. Near Sanguri Bhanjyang, 1250 m, on tree branches (Jun. 2, 1972); Phulchoki, 2100 m, on tree branches (Jul. 15, 1972, +*Papillaria Feae*).

Meteoriopsis squarrosa (Hook.) Fleisch.: Fl. E. Himal. 573 (1966); **2**: 249 (1971), det. Iwatsuki.

NEPAL. Hile–Chitre, 2350 m, on rocks (Jun. 5, 1972, +*Aerobryidium aureo-nitens, Papillaria Feae*); Chitre–Basantapur, 2350 m, on tree branches (Jun. 6, 1972); Basantapur–Dor, 2300 m (Jun. 6, 1972); Shewaden–Papung, 2050 m, on tree branches (Jun. 29, 1972, +*Papillaria Feae*); Bir Gaon–Dingla, 1050 m, on tree trunks (Jul. 1, 1972); Phulchoki, 2100–2600 m, on tree branches (Jul. 15, 1972, +*Diaphanodon blandus, Trachypodopsis serrulata* var. *crispatula*).

Meteorium Buchananii (Brid.) Broth.: Fl. E. Himal. 573 (1966); **2**: 249 (1971), det. Iwatsuki.

NEPAL. Hile–Chitre, 2150–2250 m, on bush and rocks (Jun. 5, 1972, +*Papillaria Feae*); in a forest near Chitre, 2350 m, on tree branches (Jul. 7, 1972, +*Aerobryidium filamentosum*).

Meteorium Miquelianum (C. Muell.) Fleisch. in Broth. Nat. Pfl. **1** (3): 818

(1906).

Nepal. Chitre–Basantapur, 2350 m, on tree branches (Jun. 6, 1972); Basantapur–Dor, 2300 m, on tree branches (Jun. 6, 1972); Shewaden–Papung, 2500 m, on tree branches (Jun. 29, 1972).

Distr. Widely distributed in the tropical and subtropical Asia, Oceania, and Australia. New to Himalaya.

Papillaria cf. **chrysoclada** (C. Muell.) Jaeg. in Ber. S. Gall. Naturw. Ges. **1875–76**: 270 (1877).

Nepal. Hile–Chitre, 2150 m, on rocks (Jun. 5, 1972).

Distr. Ceylon, E. Himalaya (Nepal, Sikkim), and Thailand.

Papillaria Feae C. Muell. ex Fleisch.: Fl. E. Himal. **2**: 250 (1971).

Nepal. Near Sanguri Bhanjyang, 1270 m, on rocks (Jun. 2, 1972, +*Aerobryidium aureo-nitens*); Nigale–Kuwa Pani, 1720 m, on tree trunks (Jun. 4, 1972); Hile–Chitre, 1900–2250 m, on rocks (Jun. 5, 1972, +*Aerobryidium aureo-nitens*, *Meteoriopsis squarrosa*); Chitre–Basantapur, 2350 m, on fallen tree trunks (Jun. 6, 1972); Dor–Chauke, 2550 m, on tree branches (Jun. 7, 1972); Shewaden–Papung, 2450 m, on tree branches and logs (Jun. 29, 1972, +*Meteoriopsis squarrosa*); around Sanguri Bhanjyang, 1050 m, on rocks and soil (Jul. 10, 1972, +*Meteoriopsis formosana*); Phulchoki, 2100 m, on tree branches (Jul. 15, 1972, +*Meteoriopsis reclinata*).

Distr. Ceylon, E. Himalaya, Burma, and Thailand.

Papillaria semitorta (C. Muell.) Jaeg.: Fl. E. Himal. 574 (1966); **2**: 250 (1971).

Nepal. Chitre–Basantapur, 2350 m (Jun. 6, 1972, +*Neckera crenulata*); Chauke–Lamo Pokhari, 2680 m, on humus (Jun. 8, 1972); Papung–Bir Gaon, 1800 m, on tree trunks (Jun. 30, 1972), det. Iwatsuki; Bir Gaon–Dingla, 1350 m, on rocks (Jul. 1, 1972), det. Iwatsuki; Bhuje–Gupha Pokhari, 2700 m, on humus (Jul. 4, 1972); Chauke–Dor, 2600 m, on rocks (Jul. 6, 1972); Phulchoki, 2100 m (Jul. 15, 1972).

NECKERACEAE (by Akira Noguchi)

Handeliobryum setschwanicum Broth.: Fl. E. Himal. 574 (1966).

Nepal. Shewaden–Papung, 2500 m, on rocks (Jul. 29, 1972).

Homaliodendron microdendron (Mont.) Fleisch.: Fl. E. Himal. 575 (1966).

Nepal. Phulchoki, 2100 m (Jul. 15, 1972).

Homaliodendron Montagneanum (C. Muell.) Fleisch.: Fl. E. Himal. 576 (1966); **2**: 250 (1971).

Nepal. Hile–Chitre, 2350 m, on rocks (Jun. 5, 1972); Basantapur–Dor, 2510 m, on rotten logs (Jun. 6, 1972); Dor–Chauke, 2650–2850 m, on rocks (Jun. 7 & Jul. 6, 1972); Chauke–Lamo Pokhari, 2850 m, on rocks (Jun. 8, 1972); Gupha Pokhari–Chauke, 2600 m, on tree trunks (Jul. 4, 1972); Phulchoki, 2450 m, on rocks (Jul. 15, 1972).

Distr. Himalaya, Assam, Indo-China, Indonesia, and S. W. China (Yunnan, Szechuan).

Homaliodendron sphaerocarpum Nog.: Fl. E. Himal. 576 (1966); **2**: 251 (1971).

Nepal. Basantapur–Dor, 2350 m, on tree trunks (Jun. 6, 1972).

Distr. E. Himalaya and Thailand.

Neckera crenulata Harv.: Fl. E. Himal. 576 (1966); **2**: 251 (1971).

Nepal. Hile–Chitre, 2250 m, on tree trunks (Jun. 5, 1972); Basantapur–Dor, 2350 m, on tree trunks (Jun. 6, 1972); Chitre–Basantapur, 2350 m, on tree trunks, branches and logs (Jun. 6, 1972, +*Papillaria semitorta*); Chauke–Dor, 2650 m, on tree trunks (Jul. 6, 1972); Dor–Chitre, 2500 m, on tree trunks (Jul. 7, 1972); in a forest near Chitre, 2350 m, on tree trunks (Jul. 7, 1972).

Neckera himalayana Mitt.: Fl. E. Himal. 577 (1966); **2**: 251 (1971).

NEPAL. Hile–Chitre, 2310 m, on rocky cliff (Jun. 5, 1972); Shewaden–Papung, 2450 m, on tree trunks (Jun. 29, 1972); Dor–Chitre, 2250 m, on tree trunks (Jul. 7, 1972); Phulchoki, 2400 m, on tree trunks (Jul. 15, 1972); Bhorlang–Sundarijar, 2400–1400 m (Aug. 31, 1972).

Porotrichum fruticosum (Mitt.) Jaeg.: Fl. E. Himal. 577 (1966).

NEPAL. In a mossy forest below Lamo Pokhari, 2730 m, on rocks (Jun. 9, 1972); Topke Gola–Shewaden, 2600 m, on rocky cliff (Jun. 28, 1972); Shewaden–Papung, 2300 m, on rocks (Jun. 29, 1972).

Distr. Himalaya and Formosa.

Thamnobryum latifolium (Bosch et Lac.) Nieuwl. in Amer. Midland Natur. **5**: 50 (1917).

NEPAL. Shewaden–Papung, 2350 m, on rocks (Jun. 29, 1972).

Distr. E. Himalaya, Indonesia, China, Philippines, and New Zealand. New to Himalaya.

Thamnobryum siamense (Horik. et Ando) Noguchi, comb. nov.

Thamnium siamense Horik. et Ando in Nature & Life in S. E. Asia **3**: 23 (1964).

NEPAL. Hile–Chitre, 2250 m, on tree trunks (Jun. 5, 1972).

Distr. E. Himalaya, Assam, and Thailand. New to E. Himalaya.

HOOKERIACEAE (by Akira Noguchi)

Daltonia marginata Griff. in Calcutta Journ. Nat. Hist. **3**: 270 (1843).

NEPAL. Dor–Chauke, 2550 m, on fallen branches (Jun. 7, 1972).

Distr. E. Himalaya and India (Khasia). New to Himalaya.

Hookeria acutifolia Hook. et Grev. in Edinb. Journ. Sci. **2**: 225 (1825), det. Iwatsuki.

NEPAL. In a mossy forest below Lamo Pokhari, 2850 m, on bank (Jun. 9, 1972); Shewaden–Papung, 2250 m, on soil (Jun. 29, 1972); Chauke–Dor, 2850 m, on bank (Jul. 6, 1972).

Distr. Asia (including E. Himalaya), America, and Oceania.

HYPOPTERYGIACEAE (by Akira Noguchi)

Cyathophorella adiantum (Griff.) Fleisch.: Fl. E. Himal. 577 (1966), det. Iwatsuki.

NEPAL. Shewaden–Papung, 2150 m, on trees (Jun. 29, 1972); Nessum–Bhuje, 1800 m (Jul. 3, 1972).

Distr. Himalaya and Philippines.

Cyathophorella Hookeriana (Griff.) Fleisch., Mus. Fl. Buit. **3**: 1094 (1908).

NEPAL. Hile–Chitre, 2310 m, on tree trunks (Jun. 5, 1972); Dor–Chauke, 2850 m, on branches of bamboo (Jun. 7, 1972); around Lamo Pokhari, 2800 m, on tree trunks (Jun. 8, 1972); in a mossy forest below Lamo Pokhari, 2650 m (Jun. 9, 1972).

Distr. Warm Temperate, subtropical, and tropical Asia.

Cyathophorella intermedia (Mitt.) Broth.: Fl. E. Himal. 577 (1966), det. Iwatsuki.

Nepal. Chauke-Dor, 2600 m, on tree branches (Jul. 6, 1972); Dor, 2300 m, on rocks (Jul. 6, 1972).

Distr. Himalaya, Philippines, and Formosa.

THELIACEAE (by Zennoske Iwatsuki)

Myurella sibirica (C. Muell.) Reim. in Hedwigia **76**: 292 (1937).

Nepal. Janga La-Thudam, 4580 m, in crevices of rock (Jun. 21, 1972).

Distr. Europe, E. Himalaya, China, Siberia, Japan, and N. America. New to Himalaya.

FABRONIACEAE (by Akira Noguchi)

Fabronia Schensiana C. Muell.: Fl. E. Himal. 578 (1966), det. Iwatsuki.

Nepal. Teku Nala-Dhankuta, 1070 m, on tree trunk (Jun. 4, 1972); Nessum-Bhuje, 1050 m, on tree trunk (Jul. 3, 1972).

Schwetschkeopsis formosana Nog.: Fl. E. Himal. 578 (1966).

Nepal. Topke Gola, 3600 m, on stone wall (Jun. 17 & 28, 1972); in a forest above Topke Gola, 3600 m, on rocks and tree trunks (Jun. 18, 1972); in a forest below Thudam, 3420 m, on rocks (Jun. 22, 1972).

LESKEACEAE (by Akira Noguchi)

Lescuraea incurvata (Hedw.) Lawt. in Bull. Torrey Bot. Cl. **84**: 290 (1957).

Nepal. Ghopte-Gosa, 3750 m (Jun. 13, 1972).

Distr. Widely distributed in the Northern Hemisphere.

Rhegmatodon declinatus (Hook.) Brid.: Fl. E. Himal. 578 (1966).

Nepal. Bir Gaon-Dingla, 1300 m, on rocks (Jul. 1, 1972); Phulchoki, 2100 m (Jul. 15, 1972).

THUIDIACEAE (by Zennoske Iwatsuki)

Abietinella abietina (Hedw.) Fleisch.: Fl. E. Himal. **2**: 252 (1871).

Nepal. Janga La-Thudam, 4400 m, on humus (Jun. 21, 1972,+*Rhytidium rugosum*); Lama Chungbu-Slesa, 4180 m, on humus (Jun. 24, 1972); Phujeng La-Topke Gola, on humus (Jun. 27, 1972).

Actinothuidium Hookeri (Mitt.) Broth.: Fl. E. Himal. 578 (1966); **2**: 253 (1971).

Nepal. Basantapur-Dor, 2510 m, on rocks (Jun. 6, 1972); Singum Gompa-Gosainkund, 3200-4200 m (Aug. 23, 1972); Gopte-Thale Patil, 3500 m (Aug. 26, 1972).

Distr. E. Himalaya, Assam, Burma, S. W. China (Yunnan), Formosa, and Soviet Far East.

Anomodon acutifolius Mitt.: Fl. E. Himal. **2**: 253 (1971).

Nepal. Dor-Chauke, 2730 m, on rocks (Jun. 7, 1972); Topke Gola-Shewaden, 2950 m, on rocks (Jun. 28, 1972); Phulchoki, 2650 m, on rocks (Jul. 15, 1972).

Anomodon minor (Hedw.) Fuernr.

subsp. **integerrimus** (Mitt.) Iwats.: Fl. E. Himal. 578 (1966); **2**: 253 (1971).

Nepal. Bir Gaon-Dingla, 1300 m, on rocks (Jul. 1, 1972); Phulchoki, 2400 m, on tree trunks (Jul. 15, 1972).

Anomodon Rugelii (C. Muell.) Keissl.: Fl. E. Himal. 578 (1966).

NEPAL. Chauke–Lamo Pokhari, 2620 m, on tree trunks (Jun. 8, 1972); Phulchoki, 2400 m, on rocks (Jul. 15, 1972).

Anomodon viticulosus (Hedw.) Hook. et Tayl., Musc. Brit. 79 (1818).

NEPAL. Phulchoki, 2400 m, on rocks (Jul. 15, 1972).

Distr. Widely distributed in the Northern Hemisphere.

Claopodium nervosum (Harv.) Fleisch.: Fl. E. Himal. 578 (1966).

NEPAL. Shewaden–Papung, 2150 m, on rocks (Jun. 29, 1972).

Distr. India, Himalaya, Thailand, Malaya, Indonesia, Philippines, E. China, Formosa, Korea, Japan, Oceania, and Hawaii.

Haplocladium angustifolium (Hampe et C. Muell.) Broth.: Fl. E. Himal. **2**: 253 (1971), det. Noguchi.

NEPAL. Dhankuta–Nigale, 1550 m (Jun. 4, 1972).

Herpetineuron toccoae (Sull. et Lesq.) Card. in Beih. Bot. Centralbl. **19**: 127 (1905).

NEPAL. Teku Nala–Dhankuta, 1220 m, on rocks (Jun. 4, 1972); Nigale–Kuwa Pani, 1720 m, on tree trunks (Jun. 4, 1972); Bir Gaon–Dingla, 1350 m, on rocks (Jul. 1, 1972).

Distr. Almost cosmopolitan, excluding Europe and Siberia.

Thuidium brachymenium Herz.: Fl. E. Himal. 579 (1966); **2**: 253 (1971), det. Noguchi.

NEPAL. Suke, 2900 m, on tree branches (Jun. 10, 1972, +*Diaphanodon blandus*); in a forest below Thudam, 3250 m, on rocks (Jun. 25, 1972); Papung–Bir Gaon, 2050 m, on tree trunks (Jun. 30, 1972).

Thuidium cymbifolium (Doz. et Molk.) Doz. et Molk.: Fl. E. Himal. 578 (1966); **2**: 253 (1971), det. Noguchi.

NEPAL. Numerous collections.

Distr. Tropical and subtropical Asia, and Oceania, north to Japan.

Thuidium glaucinum (Mitt.) Bosch et Lac.: Fl. E. Himal. 579 (1966); **2**: 253 (1971), det. Noguchi.

NEPAL. Nessum–Bhuje, 1800 m, on rocks (Jul. 3, 1972).

Distr. Tropical and subtropical Asia, north to Japan.

Thuidium Meyenianum (Hampe) Doz. et Molk., Bryol. Jav. **2**: 121 (1865), det. Noguchi.

NEPAL. In a *Shorea* forest, south of Dharan, 200–240 m, on tree root (Jun. 1, 1972).

Distr. Tropical and subtropical Asia, Australia and Oceania, north to Japan.

Thuidium Tamariscellum (C. Muell.) Bosch et Lac.: Fl. E. Himal. 579 (1966); **2**: 253 (1971), det. Noguchi.

NEPAL. Mohamabedi Khola–Tamur Bridge, 350 m, on tree trunks (Jun. 3, 1972); Bir Gaon–Dingla, 1050 m, on tree trunks (Jul. 1, 1972).

Distr. Tropical Asia, north to Japan (Ryukyu).

AMBLYSTEGIACEAE (by Zennoske Iwatsuki)

Cratoneuron filicinum (Hedw.) Spruce: Fl. E. Himal. **2**: 254 (1971).

NEPAL. Janga La–Thudam, 3900 m, on rocks (Jun. 21, 1972).

Calliergon sarmentosum (Wahlenb.) Kindb. in Canad. Rec. Sci. **6**: 72

(1894), det. Noguchi.

NEPAL. Janga La–Thudam, 4450 m, on rocks (Jun. 21, 1972).

Distr. Wide spread in the Northern Hemisphere, southern part of S. America, and New Zealand.

Drepanocladus uncinatus (Hedw.) Warnst.: Fl. E. Himal. **2**: 254 (1971).

NEPAL. Ghopte–Gosa, 3500–4100 m, on soil (Jun. 13, 1972); around Banduke Pokhari, 4120 m, on humus (Jun. 14, 1972); Saju Pokhari–pass to Topke Gola, 4350 m, on humus (Jun. 16, 1972); in a coniferous forest side of a pond near Topke Gola, 3600 m (Jun. 19, 1972); Jalang Chhyongo–Janga La, 4510 m, on soil (Jun. 21, 1972); Janga La–Thudam, 4600 m, on soil (Jun. 21, 1972); around Kipuphu, 4500 m, on rock (Jun. 26, 1972); Phujeng La–Topke Gola, 4650 m, on soil (Jun. 27, 1972); Gosainkund–Gopte, 3500–4400 m (Aug. 25, 1972).

BRACHYTHECIACEAE (by Noriwo Takaki)

Brachythecium Buchananii (Hook.) Jaeg.: Fl. E. Himal. 579 (1966); **2**: 254 (1971); Nog. et al. in Bull. Nat. Sci. Mus. Tokyo **9**: 374 (1966).

NEPAL. Kuwa Pani–Hile, 1860 m, on soil (Jun. 4, 1972); Janga La–Thudam, 4050 m, on rock (Jun. 21, 1972).

Brachythecium rivulare B.S.G.: Fl. E. Himal. 580 (1966).

NEPAL. Hile–Chitre, 2310 m, on rock (Jun. 5, 1972); Thudam–Lama Chungbu, 3710 m, on soil (Jun. 23, 1972); Topke Gola–Shewaden, 3400 m, on rock (Jun. 28, 1972).

Brachythecium rutabulum (Hedw.) B.S.G.: Fl. E. Himal. 580 (1966).

NEPAL. Ghopte–Gosa, 3650 m, on humus (Jun. 13, 1972).

Brachythecium salebrosum (Web. et Mohr) B.S.G.: Fl. E. Himal. 580 (1966); Nog. et al., l.c. **9**: 374 (1966).

NEPAL. Kuwa Pani–Hile, 1860 m, on rock (Jun. 4, 1972); Nessum–Bhuje, 1850 m, on tree trunk (Jul. 3, 1972).

Distr. Europe, Azores, Canaries, Morocco, Algeria, Himalaya, Tibet, Japan, Siberia, Amur, Saghalin, N. America, and Tasmania.

Brachythecium Wichurae (Broth.) Par.: Fl. E. Himal. 580 (1966).

NEPAL. Kuwa Pani–Hile, 1890 m, on soil (Jun. 4, 1972); Bir Gaon–Dingla, 1610 m, on soil (Jul. 1, 1972); Nessum–Bhuje, 1800 & 1850 m, on rock (Jul. 3, 1972).

Bryhnia novae-angliae (Sull. et Lesq.) Grout: Fl. E. Himal. 580 (1966).

NEPAL. In a mossy forest below Lamo Pokhari, 2850 m, on soil (Jun. 9, 1972).

Cirriphyllum cirrhosum (Schwaegr.) Grout in Bull. Torrey Bot. Cl. **25**: 223 (1898), det. Iwatsuki.

NEPAL. Janga La–Thudam, 4600 m, on soil (Jun. 21, 1972).

Distr. Europe, Caucasus, Turkistan, E. Nepal, China, Siberia, Greenland, and N. America. New to Himalaya.

Eurhynchium riparioides (Hedw.) Richs.: Fl. E. Himal. 580 (1966); **2**: 254 (1971).

NEPAL. Hile–Chitre, 2350 m, on rock (Jun. 5, 1972); Thudam–Lama Chungbu, 3850 m, on rock (Jun. 23, 1972); Shewaden–Papung, 2150 m, on rock (Jun. 29, 1972); Dor, 2300 m, on rock (Jul. 6, 1972).

Palamocladium nilgheriense (Mont.) C. Muell. in Flora **82**: 465 (1896).

NEPAL. Chitre-Basantapur, 2350 m, on tree trunk (Jun. 6, 1972); in a forest near Chitre, 2350 m, on tree trunk (Jul. 7, 1972); Dor-Chitre, 2500 m, on tree trunk (Jul. 7, 1972).

Distr. E. Nepal, Assam, Nilghiri Hills, Ceylon, Java, and China.

In some packets, numerous dwarf males are found on the leaves of female plants.

Rhynchostegium vagans (Harv.) Jaeg.: Fl. E. Himal. 581 (1966).

NEPAL. Shewaden-Papung, 2200 m, on bank (Jun. 29, 1972); Doban-Nessum, 900 m, on rock (Jul. 2, 1972).

ENTODONTACEAE (by Urara Mizushima)

Campylodontium flavescens (Hook.) Bosch et Lac.: Fl. E. Himal. 581 (1966).

NEPAL. Bir Gaon-Dingla, 1610 m (Jul. 1, 1972).

Entodon angustifolius (Mitt.) Jaeg.: Fl. E. Himal. 581 (1966).

NEPAL. Hile-Chitre, 1990 m (Jun. 5, 1972); Bir Gaon-Dingla, 1150 m and 1350 m (Jul. 1, 1972).

Entodon concinnus (De Not.) Paris.

subsp. **caliginosus** (Mitt.) U. Miz.: Fl. E. Himal. 582 (1966).

NEPAL. Dor-Chauke, 2850 m (Jun. 7, 1972).

Entodon flavescens (Hook.) Jaeg.: Fl. E. Himal. 583 (1966).

NEPAL. Topke Gola-Shewaden, 2650 m (Jun. 28, 1972); Chauke-Dor, 2600 m (Jul. 6, 1972).

Entodon laetus (Griff.) Jaeg.: Fl. E. Himal. 583 (1966); **2**: 254 (1971).

NEPAL. Hile-Chitre, 2350 m (Jun. 5, 1972); Dor-Chauke, 2730 m (Jun. 7, 1972).

Entodon cf. **luridus** (Griff.) Jaeg. in Ber. S. Gall. Nature. Ges. **1876–77**: 294 (1878).

NEPAL. Lamo Pokhari, 2620 m (Jun. 8, 1972); in a mossy forest below Lamo Pokhari, 2650 m (Jun. 9, 1972).

The above material lacks the capsule which is the most important characteristic of the plant, so I cannot make clear determination of this species. The other characteristics, the appearance of the plant, leaf shape, and the cells of the leaf blade and the alar parts are very similar to those of *E. luridus*. If the present specimens are identical with *E. luridus*, this is the first record for the Nepalese Flora. The known distribution of *E. luridus* covers Assam, China (Kweichow), Korea, and Japan.

Entodon myurus (Hook.) Hampe: Fl. E. Himal. 584 (1966).

NEPAL. Papung-Bir Gaon, 1650 m (Jun. 30, 1972); Bir Gaon-Dingla, 1350 m and 1610 m (Jul. 1, 1972).

Entodon plicatus C. Muell.: Fl. E. Himal. 584 (1966); **2**: 254 (1971).

NEPAL. Teku Nala-Dhankuta, 1230 m (Jun. 4, 1972); Dhankuta-Nigale, 1550 m (Jun. 4, 1972); Papung-Bir Gaon, 1800 m (Jun. 30, 1972); Bir Gaon-Dingla, 1300 m (Jul. 1, 1972); around Sanguri Bhanjyang, 1050 m (Jul. 10, 1972).

Entodon prorepens (Mitt.) Jaeg.: Fl. E. Himal. 586 (1966); **2**: 254 (1971).

NEPAL. Teku Nala-Dhankuta, 800-1800 m (Jun. 4, 1972); Dhankuta-Nigale, 1300-1600 m (Jun. 4, 1972); Hile-Chitre, 1990 m (Jun. 5, 1972); Dor-Chauke, 2850 m (Jun. 7, 1972); Chauke-Lamo Pokhari, 2620 m (Jun. 8, 1972); Shewaden-Papung, 2500 m (Jun. 29, 1972); Phulchoki, 2550 m (Jul. 15, 1972).

Entodon rubicundus (Mitt.) Jaeg.: Fl. E. Himal. 586 (1966); **2**: 254 (1971).

Nepal. Near Sanguri Bhanjyang, 1250 m (Jun. 2, 1972); Hile-Chitre, 1900 m (Jun. 5, 1972); Shewaden-Papung, 2150 m (Jun. 29, 1972); Bir Gaon-Dingla, 1300 m (Jul. 1, 1972); near a waterfall below Chitre, 2250 m (Jul. 8, 1972).

Erythrodontium julaceum (Schwaegr.) Paris: Fl. E. Himal. 587 (1966); **2**: 255 (1971), det. Noguchi.

Nepal. Teku Nala-Dhankuta, 980 m, on tree trunk (Jun. 4, 1972), Bir Gaon-Dingla, 1400 m, on tree trunk (Jul. 1, 1972).

Orthothecium intricatum (Hartm.) B.S.G., Bryol. Eur. **5**: 108 (1851), det. Iwatsuki.

Nepal. Janga La-Thudam, 4550 m, on rock (Jun. 21, 1972).

Distr. Europe, Pyrenees, Caucasus, N. Africa, Kashmir, Himalaya, Japan, N. America, and Greenland. New to Himalaya.

Rozea pterogonioides (Hook.) Jaeg.: Fl. E. Himal. 588 (1966); **2**: 255 (1971), det. Noguchi.

Nepal. Suke-Hile Chok, 3200 m, on tree trunk (Jun. 11, 1972); Ghopte-Gosa, 3750 m, on rocks (Jun. 13, 1972); in a coniferous forest above Topke Gola, 3600 m, on rocky cliff (Jun. 18, 1972); in a forest below Thudam, 3250 m, on rotten log (Jun. 25, 1972); Topke Gola-Shewaden, 3450 m, on tree trunk (Jun. 28, 1972).

Trachyphyllum inflexum (Harv.) Gepp: Fl. E. Himal. 588 (1966), det. Iwatsuki.

Nepal. Near Sanguri Bhanjyang, 660 m, on tree trunk (Jun. 2, 1972); Dhara Pani-Mohamabedi Khola, 880 m, on tree trunk (Jun. 3, 1972); Mohamabedi Khola-Tamur Bridge, 350 m, on tree trunk (Jun. 3, 1972); Dingla-Doban, 800 m, on tree trunk (Jul. 2, 1972).

Distr. Madagascar, Ceylon, E. Himalaya, C. & S. India, Indo-China, Malacca, Philippines, Java, and New Caledonia.

PLAGIOTHECIACEAE (by Zennoske Iwatsuki)

Isopterygiopsis Muelleriana (Schimp.) Iwats.: Fl. E. Himal. **2**: 255 (1971).

Nepal. Suke-Hile Chok, 3250–3350 m, on soil (Jun. 11, 1972); Hile Chok-Ghopte, 3400 m, on rock in shade (Jun. 12, 1972); Ghopte-Gosa, 3750 m, on rock (Jun. 13, 1972); above Topke Gola, 3610 m, on soil (Jun. 18, 1972); Phujeng La-Topke Gola, 4800–3600 m, in crevices of rock (Jun. 27, 1972).

Distr. Europe, E. Himalaya, China, Japan, Soviet Far East, and N. America.

Isopterygium albescens (Hook.) Jaeg.: Fl. E. Himal. 588 (1966).

Nepal. Below Lamo Pokhari, 2680–2730 m, on tree trunk and rotten wood (Jun. 9, 1972).

Isopterygium distichaceum (Mitt.) Jaeg.: Fl. E. Himal. 588 (1966).

Nepal. Hile-Chitre, 2250–2350 m, on rock and base of tree (Jun. 5, 1972); Basantapur-Dor, 2510 m, on rock (Jun. 6, 1972); Chitre-Basantapur, 2350 m, on soil (Jun. 6, 1972); Suke, 2900 m, on soil (Jun. 10, 1972); above Topke Gola, 3650 m (Jun. 18, 1972); Shewaden-Papung, 2250–2500 m, on soil (Jun. 29, 1972).

Distr. Ceylon, India, E. Himalaya, and N. America.

Plagiothecium cavifolium (Brid.) Iwats.: Fl. E. Himal. **2**: 255 (1971).

Nepal. Gosa-Banduke Pokhari, 4050 m, on soil (Jun. 14, 1972); Shewaden-Papung, 2500 m, on rock (Jun. 29, 1972).

Distr. Europe, Caucasus, Himalaya, Korea, Japan, Soviet Far East, and N. America.

Plagiothecium denticulatum (Hedw.) B.S.G., Bryol. Eur. **5**: 190 (1851).

NEPAL. Ghopte-Gosa, 4020 m, on soil (Jun. 13, 1972).

Distr. Almost cosmopolitan.

Plagiothecium neckeroideum B.S.G.: Fl. E. Himal. 589 (1966); **2**: 255 (1971).

NEPAL. Chitre-Basantapur, 2350 m, on tree trunk (Jun. 6, 1972); Dor-Chauke, 2650-2850 m, on rotten stump (Jun. 7, 1972); above Topke Gola, 3610 m, on rock (Jun. 18, 1972); below Thudam, 3250-3650 m, on rock (Jun. 25, 1972); Phujeng La-Topke Gola, 4600 m, in crevices of cliff (Jun. 27, 1972); Topke Gola-Shewaden, 3150 m, on rock (Jun. 28, 1972); Thale Patil-Mangen, 3100-3400 m (Aug. 27, 1972).

Distr. Europe, India, E. Himalaya (Nepal, Sikkim), Indo-China, Indonesia, Philippines, New Guinea, Formosa, Japan, and Soviet Far East.

var. **sikkimense** Ren. et Card.: Fl. E. Himal. **2**: 255 (1971).

NEPAL. Hile-Chitre, 2350 m, on rock (Jun. 5, 1972); Basantapur-Dor, 2370-2510 m, on tree trunk (Jun. 6, 1972); Saju Pokhari-pass to Topke Gola, 4200 m, on rock (Jun. 16, 1972); above Topke Gola, 3610 m, on rock (Jun. 18, 1972); Thudam-Lama Chungbu, 3650 m, on tree trunk (Jun. 23, 1972); Topke Gola-Shewaden, 3050-3300 m, on tree trunk (Jun. 28, 1972); Shewaden-Papung, 2500 m, on rock (Jun. 29, 1972).

Plagiothecium nemorale (Mitt.) Jaeg. in Ber. S. Gall. Naturw. Ges. **1876-1877**: 451 (1878).

P. sylvaticum (Brid.) B.S.G. sensu Iwatsuki in Fl. E. Himal. 589 (1966).

NEPAL. Basantapur-Dor, 2300-2600 m, on shaded cliff (Jun. 6, 1972); Dor-Chauke, 2750 m, on rock (Jun. 7, 1972); Chauke-Lamo Pokhari, 2620 m, on rock (Jun. 8, 1972); Ghopte-Gosa, 3750 m, on rock (Jun. 13, 1972); Lama Chungbu-Slesa, 4250 m, on soil (Jun. 24, 1972); Topke Gola-Shewaden, 3150-3400 m, on rock (Jun. 28, 1972); Chauke-Dor, 2850 m, on bank (Jul. 6, 1972).

Distr. Europe, Africa, Himalaya, India, Indo-China, China, Formosa, Korea, Japan, and Siberia.

Stereophyllum Tavoyense (Hook.) Jaeg. in Ber. S. Gall. Naturw. Ges. **1877-1878**: 279 (1880).

NEPAL. Dhankuta-Nigale, 1550-1800 m, on tree trunk (Jun. 4, 1972); Bir Gaon-Dingla, 1150-1350 m, on tree trunk (Jul. 1, 1972).

Distr. India, Himalaya (Nepal, Sikkim), Burma, and Thailand.

Taxiphyllum taxirameum (Mitt.) Fleisch.: Fl. E. Himal. 589 (1966).

NEPAL. South of Dharan, 200-240 m, on soil (Jun. 1, 1972); Mohamabedi Khola-Tamur Bridge, 270 m, on soil (Jun. 3, 1972); Topke Gola-Shewaden, 3050 m, on rock (Jun. 28, 1972); Bir Gaon-Dingla, 1050-1350 m, on rock (Jul. 1, 1972).

Distr. Ceylon, India, Himalaya, Indo-China, Indonesia, Philippines, New Guinea, China, Formosa, Korea, Japan, Soviet Far East, America, West Indies, and Samoa.

SEMATOPHYLLACEAE (by Tarow Seki)

Aptychella planula (Mitt.) Fleisch.: Fl. E. Himal. 589 (1966); **2**: 255 (1971).

NEPAL. Chauke-Lamo Pokhari, 2580 m, on tree branch (Jun. 8, 1972, c.fr.).

Brotherella curvirostris (Schwaegr.) Fleisch. in Nov. Guinea **12**: 120 (1914).

NEPAL. Topke Gola, 3600 m, on fire woods (Jun. 17, 1972); Topke Gola-Shewaden, 3450 m, on rock (Jun. 28, 1972, c.fr.).

Distr. Himalaya.

Brotherella nictans (Mitt.) Broth. in Nat. Pfl. ed. 2, **11**: 425 (1925).

NEPAL. Basantapur-Dor, 2510 m, on tree trunk (Jun. 6, 1972).

Distr. E. Himalaya and S. W. China (Yunnan, Szechuan).

Brotherella perpinnata (Broth.) Fleisch.: Fl. E. Himal. **2**: 256 (1971).

NEPAL. Chauke-Lamo Pokhari, 2680 m, on tree trunk (Jun. 8, 1972); Gosa-Banduke Pokhari, 4050 m, on tree (Jun. 14, 1972,+*Drepanocladus uncinatus*); Topke Gola-Shewaden, 3300 m, on tree trunk (Jun. 28, 1972).

Brotherella propinqua (Harv.) Fleisch.: Fl. E. Himal. **2**: 256 (1971).

NEPAL. Basantapur-Dor, 2510 m, on tree trunk (Jun. 6, 1972).

Clastobryum subplanulum Broth. et Dix. in Ann. Bryol. **6**: 33 (1933).

NEPAL. Basantapur-Dor, 2510 m, on root of tree (Jun. 6, 1972, c.fr.); Chauke-Lamo Pokhari, 2680 m, (Jun. 8, 1972, c.fr.).

Distr. Himalaya.

Glossadelphus glossoides (Bosch et Lac.) Fleisch., Musci Fl. Buit. **4**: 1358 (1923).

NEPAL. Basantapur-Dor, 2350 m, on rock (Jun. 6, 1972).

Distr. Himalaya, Thailand, Java, Sumatra, and New Guinea. New to Himalaya.

Pylaisiopsis speciosa (Mitt.) Broth. in Nat. Pfl. **1**(3): 1232 (1909).

NEPAL. Suke-Hile Chok, 2900-3600 m (Jun. 11, 1972, c.fr.); Topke Gola, 3600 m (Jun. 17, 1972, c.fr); Topke Gola-Shewaden, 3550 m, on branch (Jun. 28, 1972, c.fr.).

Distr. E. Himalaya (Nepal, Sikkim). New to Nepal.

Sematophyllum subhumile (C. Muell.) Fleisch., Musci Fl. Buit. **4**: 1264 (1923)-Seki in Journ. Sci. Hiroshima Univ., ser. B, div. 2, **12**: 42 (1968).

subsp. **subhumile**.

NEPAL. Bir Gaon-Dingla, 1300 m, on tree (Jul. 1, 1972, c.fr.).

Distr. Ceylon, S. India, E. Himalaya (Nepal), Assam, Burma, Thailand, and Java.

Struckia argentata (Mitt.) C. Muell.: Fl. E. Himal. 589 (1966); **2**: 255 (1971).

NEPAL. Dor-Chauke, 2730 m, on rock (Jun. 7, 1972); Ghopte-Gosa, 3850 m, on branch (Jun. 13, 1972); loc. cit., 4000 m, on rock (Jun. 13, 1972).

Wijkia lepida (Mitt.) Crum in Bryologist **74**: 172 (1971).

NEPAL. Shewaden-Papung, 2500 m, on rock (Jun. 29, 1972).

Distr. E. Himalaya (Nepal, Sikkim). New to Nepal.

Wijkia penicillata (Mitt.) Crum in Bryologist **74**: 173 (1971).

NEPAL. Basantapur-Dor, 2550 m, on tree trunk (Jun. 6, 1972, c.fr.); Dor-Chauke, 2850 m, on rotten log (Jun. 7, 1972,+*Hypnum subimponens* subsp. *ulophyllum*); in a mossy forest below Lamo Pokhari, 2730 m, on rotten trunk (Jun. 9, 1972); loc. cit., 2730 m, on rock (Jun. 9, 1972, c.fr.); loc. cit., 2680 m, on tree trunk (Jun. 9, 1972, c.fr., phyllodioicous); Shewaden-Papung, 2500 m, on tree trunk (Jun. 29, 1972, c.fr.).

Distr. E. Himalaya (Nepal, Sikkim). New to Nepal.

HYPNACEAE (by Hisatsugu Ando)

Bryosedgwickia aurea (Schwaegr.) Fleisch. in Hedwigia **63**: 211 (1922).
Pylaisia aurea (Schwaegr.) Broth.: Fl. E. Himal. 591 (1966).

NEPAL. Phulchoki, summit area, 2700 m, on tree trunk (Jul. 15, 1972, c.fr.).

Distr. Himalaya (Nepal, Sikkim, Bhutan) and Khasia.

Gollania clarescens (Mitt.) Broth.: Fl. E. Himal. **2**: 256 (1971).

NEPAL. Ghopte–Gosa, 3900–4020 m, on soil and humus (Jun. 13, 1972).

Hypnum macrogynum Besch. in Ann. Sci. Nat. Bot. 7 sér. **15**: 91 (1892).
H. flaccens Besch.: Fl. E. Himal. **2**: 256 (1971).

NEPAL. Chauke–Lamo Pokhari, 2680–2850 m, on humus (Jun. 8, 1972); Lamo Pokhari–Gupha Pokhari, 2800–2850 m, on soil and humus (Jun. 10, 1972); Hile Chok-Ghopte, 3400 m, on humus (Jun. 12, 1972); Ghopte–Gosa, 3800 m, on humus (Jun. 13, 1972); Gosa–Banduke Pokhari, 4210 m, on humus (Jun. 14, 1972); Banduke Pokhari–Saju Pokhari, 4010 m, on soil (Jun. 15, 1972); in a coniferous forest above Topke Gola, 3600–3610 m, on tree trunk and rotten log (Jun. 18, 1972); Lama Chungbu–Slesa, 4180 m, on humus (Jun. 24, 1972); Thudam–Kipuphu, 4000 m, on soil (Jun. 26, 1972); Gopte–Thale Patil, 3500–3200 m (Aug. 26, 1972).

Distr. E. Himalaya, Burma, S. China, and Formosa.

Hypnum setschwanicum (Broth.) Ando in Hikobia **6**: 211 (1973).

NEPAL. Dor–Chauke, 2850 m, on rock (Jun. 7, 1972); Ghopte–Gosa, 3700 m, on rock (Jun. 13, 1972).

Distr. E. Himalaya (Nepal, Bhutan) and S. China (Yunnan, Szechuan).

Hypnum sikkimense Ando: Fl. E. Himal. **2**: 256 (1971).

NEPAL. In a forest below Thudam, 3250 m, on tree trunk (Jun. 25, 1972, c.fr.); Topke Gola–Shewaden, 3000 m, on branch (Jun. 28, 1972, c.fr.).

Distr. E. Himalaya (Nepal, Sikkim, Bhutan). New to Nepal.

Hypnum subimponens Lesq.
subsp. **ulophyllum** (C. Müll.) Ando: Fl. E. Himal. **2**: 257 (1971).

NEPAL. Dor–Chauke, 2850 m, on rotten log (Jun. 7, 1972, c.fr.); in a coniferous forest above Topke Gola, 3600 m, on soil (Jun. 18, 1972, c.fr.); Topke Gola–Shewaden, 3400 m, on rock (Jun. 28, 1972, c.fr., +*Hypnum macrogynum*); Shewaden–Papung, 2500 m, on rock (Jun. 29, 1972, c.fr.).

Distr. E. Himalaya (Nepal, Bhutan), Assam, China, Formosa, Korea, and Japan.

Leiodontium gracile Broth. in Symb. Sin. **4**: 127 (1929).

NEPAL. In a forest below Thudam, 3250 m, on rock (Jun. 25, 1972); Topke Gola–Shewaden, 3200 m, on tree trunk (Jun. 28, 1972, c.fr.).

Distr. Nepal and S. China (N. W. Yunnan). New to Himalaya.

The genus *Leiodontium* Broth. (1929), described from Yunnan with two species, is possibly identical with the genus *Stenotheciopsis* Fleisch. (1923) which was established based on *S. serrula* (Mitt.) Fleisch. (Sikkim & Kumaon; sterile). A decisive conclusion, however, is reserved until sporophytes of *S. serrula* are found. *Leiodontium gracile* is distinguished from *S. serrula* by the more slender-acuminate leaves with longer laminal cells.

Leptohymenium tenue (Hook.) Schwaegr.: Fl. E. Himal. 590 (1966); **2**:

257 (1971), det. Noguchi.

NEPAL. Topke Gola–Shewaden, 3400 m, on rocks (Jun. 28, 1972); Shewaden–Papung, 2200 m, on rotten logs (Jun. 29, 1972).

Distr. India, Himalaya, Khasia, Burma, Thailand, S. W. China (Yunnan), and Philippines.

Macrothamnium macrocarpum (Reinw. et Hornsch.) Fleisch.: Fl. E. Himal. 590 (1966); **2**: 257 (1971), det. Noguchi.

NEPAL. Near Sanguri Bhanjyang, 1200 m, on rocks (Jun. 2, 1972); Dor–Chauke, 2630 m, on rocks (Jun. 7, 1972); Lamo Pokhari–Gupha Pokhari, 2850 m, on rocks (Jun. 10, 1972); Suke–Hile Chok, 3200 m, on tree trunks (Jun. 11, 1972); Hile Chok–Ghopte, 3350 m, on rocks (Jun. 12, 1972); Topke Gola–Shewaden, 3350 m, on rocks (Jun. 28, 1972); Shewaden–Papung, 2500 m, on rocks (Jun. 29, 1972); Papung–Bir Gaon, 1800 m, on rocks (Jun. 30, 1972); in a forest near Chitre, 3200 m, on tree trunks (Jul. 7, 1972).

Macrothamnium psilurum (Mitt.) Nog. in Kumamoto Journ. Sci. Biol. **11**: 10 (1972), det. Noguchi.

Leptocladiella psilura (Mitt.) Fleisch.: Fl. E. Himal. **2**: 257 (1971).

NEPAL. Gupha Pokhari–Chauke, 2600 m (Jul. 4, 1972).

Macrothamnium submacrocarpum (Ren. et Card.) Fleisch.: Fl. E. Himal. 590 (1966); **2**: 257 (1971), det. Noguchi.

NEPAL. Chitre–Basantapur, 2350 m, on rotten logs (Jun. 6, 1972); Basantapur–Dor, 2350 m, on rocks (Jun. 6, 1972); in a forest below Thudam, 3250 m, on tree trunks and rocks (Jun. 25, 1972); Topke Gola–Shewaden, 3300 m, on tree trunks (Jun. 28, 1972); Shewaden–Papung, 2250 m, on rocks (Jun. 29, 1972).

Pleurozium Schreberi (Brid.) Mitt. in Journ. Linn. Soc. Bot. **12**: 437 (1869), det. Noguchi.

Calliergonella Schreberi (Brid.) Grout: Fl. E. Himal. 590 (1966); **2**: 256 (1971).

NEPAL. Suke–Hile Chok, 3550 m, on humus (Jun. 11, 1972); Gosa–Banduke Pokhari, 4050 m, on humus (Jun. 14, 1972); Janga La–Thudam, 4400 m, on humus (Jun. 21, 1972); Lama Chungbu–Slesa, 4180 m, on humus (Jun. 24, 1972); in a forest below Thudam, 3230 m, on rocks (Jun. 25, 1972); Thudam–Kipuphu, 3850 m, on soil (Jun. 26, 1972).

Ptilium crista-castrensis (Hedw.) De Not., Cronac. Briol. Ital. **2**: 17 (1867).

Hypnum crista-castrensis Hedw.: Fl. E. Himal. **2**: 256 (1971).

NEPAL. Gosa–Banduke Pokhari, 4050 m, on humus (Jun. 14, 1972); in a coniferous forest above Topke Gola, 3600 m, on soil (Jun. 18, 1972).

Rhytidium rugosum (Hedw.) Kindb.: Fl. E. Himal. **2**: 258 (1971), det. Noguchi.

NEPAL. Janga La–Thudam, 4400 m, on soil (Jun. 21, 1972,+*Abietinella abietina*); Lama Chungbu–Slesa, 4200 m, on humus (Jun. 24, 1972); Phujeng La–Topke Gola, 3650 m, on soil (Jun. 27, 1972).

HYLOCOMIACEAE (by Akira Noguchi)

Hylocomium himalayanum (Mitt.) Jaeg.: Fl. E. Himal. 591 (1966).

NEPAL. Topke Gola–Shewaden, 3050 m, on soil covering rocks (Jun. 28, 1972).

Hylocomium splendens (Hedw.) B.S.G.: Fl. E. Himal. **2**: 258 (1971), det.

Iwatsuki.

NEPAL. Suke-Hile Chok, 3550 m, on humus (Jun. 11, 1972); in a coniferous forest side of a pond near Topke Gola, 3600 m, on humus (Jun. 19, 1972).

A REVISION OF THE EASTERN HIMALAYAN SPECIES OF THE SUBGENUS RHODIOLA OF THE GENUS *SEDUM* (CRASSULACEAE)

by

Hideaki OHBA

The present study aims to provide a revision of the eastern Himalayan species of the subgenus Rhodiola of the genus *Sedum* (Crassulaceae). The area designated as eastern Himalaya in this paper extends from Nepal through Sikkim and southernmost Tibet (Chumbi Valley) to Bhutan. The subgenus Rhodiola is characterized mainly in having fleshy rhizomes bearing radical or scaly leaves and flowering stems arising from axils of radical or scaly leaves. Rhodiola includes about 50 species. Geographically the species of Rhodiola are distributed in the temperate and frigid regions of the northern hemisphere, but most of them concentrate in the alpine regions from the Himalayas to N. W. China and in the Central Asia.

Studies of the Himalayan Rhodiola were started by J. D. Hooker and Thomson when they published 'Conspectus' in Praecursores ad Floram Indicam in 1858, though prior to Hooker and Thomson some species were already described by D. Don, Royle, Edgeworth, etc. Hooker and Thomson treated Rhodiola as a section of the genus *Sedum* and recognized 18 species. Hooker and Thomson's treatment of Rhodiola was mostly followed by C. B. Clarke (1878) in Hooker's Flora of British India, vol. **2**. Since then, there was a little attempt to revise the species of Rhodiola in the Himalayan region, e.g. R.-Hamet published critical reviews of *S. humile* (1925), the *S. linearifolium* group (1926) and *S. Hobsonii* (1926), and numerous new species were described by R.-Hamet and by Praeger. Praeger (1921) proposed a new concept on the infrageneric treatment of the genus *Sedum* based on its cultivated species. His treatment was mostly followed by Berger (1930) in the second edition of Engler and Prantl's Die natürlichen Pflanzenfamilien. Fröderström (1930–35) adopted a relatively broad concept of the genus *Sedum* in his monograph in which Rhodiola was recognized as a section and divided into four groups, i.e. Primuloides, Chamae-Rhodiola, Eu-Rhodiola, and Trifida, based mainly on the differences in vegetative features. In 1942, Fröderström revised the Chamae-Rhodiola group. In the present study, Rhodiola, treated as a subgenus, is divided into five sections, i.e. Hobsonia, Primuloida, Smithia, Prainia and Rhodiola. The section Rhodiola is subdivided into two subsections, Chamaerhodiola and Rhodiola.

In eastern Himalaya, most of the species of the subgenus Rhodiola grow in the alpine zone and some of them ascend to more than 6000 m in altitude. Rhodiola is the most conspicuous element and often dominates in alpine desert and windward grassland developed on windblown slopes, windswept mountain summits and ridges, boulder drifts, scree, etc. Some species such as *S. himalense*, associate with alpine dwarf-shrubs dominated by *Rhododendron Anthopogon*, *R. lepidotum* and *R. setosum*. To such alpine regions, Rhodiola is considered to be much favourable by means of its structure and functions as having well-developed rhizomes, succulent stem and leaves, and Crassulaceous acid metabolism.

The species of Rhodiola show so considerably wide ranges of variation, especially in vegetative structures, that the delimitation between species often becomes obscure. It appears to me that the strong variability is caused by inconstancy of the growth period in higher altitudes. On the contrary, morphological diversity among the species is inconspicuous, especially in floral organs. These factors suggest that the current differentiation of species in eastern Himalaya is a fairly recent evolutionary development, although isolation and speciation have not always led to morphological differentiation.

Among 21 species of Rhodiola known from this region, 12 are dioecious. All the species in the subsection Chamaerhodiola, which grow at higher altitudes even ascending to 6000 m, are dioecious, although one might expect that the bisexual species would grow at higher altitudes where insect pollination may be unreliable because of short flowering periods and unfavourable weather conditions. The bisexual species among Rhodiola, i.e. *Sedum linearifolium*, *S. ovatisepalum*, *S. nepalicum*, *S. sacrum*, *S. Wallichianum*, *S. Prainii*, *S. Smithii*, *S. humile* and *S. Hobsonii*, occur in rather arid regions or relatively low altitudes.

This revision is based mainly upon my field observations and studies of the specimens of the following herbaria: BM: British Museum (Natural History), London, Great Britain; BO: Herbarium Bogoriense, Lembaga Biologi Nasional, Bogor, Indonesia; CAL: Central National Herbarium, Botanical Survey of India, Calcutta, India; E: Royal Botanic Garden, Edinburgh, Great Britain; GB: Herbarium, Institute of Systematic Botany, University of Göteborg, Göteborg, Sweden; K: The Herbarium and Library, Royal Botanic Gardens, Kew, Great Britain; KATH: Department of Medicinal Plants, Ministry of Forests, Kathmandu, Nepal; KYO: Department of Botany, Faculty of Science, Kyoto University, Kyoto, Japan; LE: Herbarium of the Komarov Botanical Institute of the Academy of Sciences of the U.S.S.R., Leningrad, U.S.S.R.; P: Laboratoire de Phanérogamie, Muséum National d'Histoire Naturelle, Paris, France; TI: Department of Botany, Faculty of Science, University of Tokyo, Tokyo, Japan; TNS: The National Science Museum, Tokyo, Japan.

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Sedum L. subgen. **Rhodiola** (L.) H. Ohba, stat. nov.

Rhodiola L. [Gen. Pl. ed. 1, 318 (1737)], Sp. Pl. ed. 1, 1035 (1753)-Fischer et Meyer in A. Schrenk, Enum. Pl. Nov. **1**: 67 (1841)-A. Boriss. in Komarov, Fl. USSR **9**: 24 (1939)-Webb in Fl. Europ. **1**: 363 (1964), non Loureiro (1790).

Sedum L. sect. Rhodiola (L.) Scopoli, Fl. Carn. ed. 2, **1**: 326 (1771)-Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 95 (1858)-Maxim. in Bull. Acad. Sci. St. Pétersb. **29**: 124 (1883)-Praeger in Journ. Roy. Hort. Soc. **46**: 26 (1921)-Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 439 (1930), pro majore parte, excl. *S. sikokianum*, *S. Durisii*, et *S. tuberosum*-Fröd. in Act. Hort. Gothob. **5**: append. 16 (1930); **15**: 3 (1942).

Clemensia Rose in Bull. New York Bot. Gard. **3**: 3 (1903).

Chamaerhodiola (A. Schrenk) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 27 (1934).

Perennial herb. Rhizomes fleshy, massive or slender, bearing radical or scaly leaves, usually the apical part epigaeous. Flowering stems arising from the axils of radical or scaly leaves, annual but in sect. Rhodiola the dead flowering stems often remaining, simple, foliiferous. Cauline leaves alternate, crassus, estipulate, simple, usually symmetric in shape. Inflorescences terminal, usually a compound or simple corymb or dichasium but rarely (*S. Hobsonii*) helicoid cyme or rarely reduced a single flower, mostly bracteate, pedunculate and pedicellate. Bracts leafy. Flowers actinomorphic, dioecious or hermaphrodite, when dioecious, in the male flowers the petals and nectar-scales opposite but in the female flowers petals and nectar-scales alternate; when hermaphrodite, petals and nectar-scales opposite. Calyx persistent, not spurred, deeply divided into (3–)4–5(–6)-lobes, green, crassus, usually stomatiferous. Petals mostly distinct, nearly symmetrical, as many as the calyx-lobes, white, reddish, purplish-red or yellow. Androecia 2 whorls, obdiplostemonous, usually twice as many as petals, the oppositipetalous stamens mostly epipetalous, the alternipetalous ones usually distinct, anthers ellipsoidal or ovoidal, 2-celled, dehiscing longitudinally, mostly basifixed but rarely (*S. Hobsonii*) dorsifixed, before dehiscing usually purplish red and after dehiscence becoming yellow. Nectar-scales usually linear to oblong or semicircular. Gynoecia superior, basally connate, usually as many as petals. Ovary uniloculed, unicarpelled, sessile, the style very short and slender, the stigma epapillate or minutely mamillate, the ovules many to a few, usually descending, 0.6–1 mm long, ellipsoidal, anatropous, the placenta nearly marginal. Fruit a follicle. Seed exalbuminous, less than 5 mm long.

Key to the sections and species.

1. Radical leaves developed, forming a lax rosette.
    2. Anthers dorsifixed. Inflorescence forming a helicoid cyme. Radical leaves deciduous. Scaly leaves dimorphic, the larger ones with a linear or oblong apical appendage (1–1.5 mm long 0.4–0.6 mm wide). Cauline leaves 2–4.5 mm wide, usually spathulate or narrowly obovate or trullate. Petals erect at anthesis [Sect. Hobsonia] .... *S. Hobsonii* (p. 289)
    2. Anthers basifixed. Flowers usually solitary or forming a small corymb. Radical leaves deciduous, but the petioles long persistent after death and

rigescent, densely tufted. Scaly leaves not dimorphic, lacking any apical appendages. Cauline leaves 0.9–2.3 mm wide, linear-ovate or -elliptic. Petals ascending at anthesis [Sect. Primuloida] .... *S. humile* (p. 292)

1. Radical leaves not developed 3
   3. Scaly leaves distinctly heteromorphic, the larger ones with a linear or oblong apical appendage (the appendage 1.5–3 mm long 0.3–0.8 mm wide) [Sect. Smithia] .... *S. Smithii* (p. 296)
   3. Scaly leaves not dimorphic, lacking apical appendages 4
      4. Cauline leaves 4 to 6, nearly verticillate [Sect. Prainia] 5
         5. Flowers hermaphrodite. Inflorescence bracteate, forming a corymb or a corymbosely compound-dichasium, 13–18-flowered, peduncles and pedicels 1.3–2.5 mm long. Cauline leaves usually 4, the petiole 1–3 cm long, the lamina 2–6 cm long 2.5–4 cm wide .... *S. Prainii* (p. 299)
         5. Flowers dioecious. Inflorescence ebracteate, forming a small but long pedicellate, simple or monochasial corymb, (1–)3–6-flowered, peduncles about 5 mm long, pedicels 10–13 mm long. Cauline leaves 5 or 6, the petiole 0.2–0.35 cm long, the lamina 0.8–1.5 cm long 0.4–0.7 cm wide .... *S. Stapfii* (p. 301)
      4. Cauline leaves many, alternately arranged throughout or rarely aggregate [Sect. Rhodiola] 6
         6. Rhizome densely surrounded by tufts of the former years' old flowering stems. Annotious flowering stems 2–25 [Subsect. Chamaerhodiola] 7
            7. Cauline leaves linear to linear-elliptic or linear-ovate to linear-obovate or very narrowly ovate (SADT n. 36)[1], 3–12 mm long 0.6–1.5 mm wide 8
               8. Plant usually less than 5 cm high. Annotious flowering stems 2–10 in number. Leaves 3–7 mm long 0.6–0.8 mm wide, linear to linear-elliptic. Flowers usually solitary but rarely forming a dichasium, mostly 4-merous but rarely 3- or 5-merous. Petals 2.5–3.5 mm long, 0.8–1.7 mm wide. Gynoecia of female plants 4–6 mm long, connate in the lower 1/4–2/5 part ventrally .... *S. quadrifidum* (p. 345)
               8. Plant usually 6–13 cm high. Annotious flowering stems (6–) 8–15(–20) in number. Leaves 8–12 mm long 1.2–1.5 mm wide, linear-ovate or -obovate or very narrowly ovate. Flowers (4–)6–14(–17), forming a monochasium-fascicles, mostly 5-merous but occaisionally 4-merous. Petals 3.5–6 mm long (1–) 1.3–1.7 mm wide. Gynoecia 6–8 mm long, connected the lower 1/15–1/20 part ventrally .... *S. fastigiatum* (p. 350)
            7. Cauline leaves narrowly obovate (SADT n. 45–46) to narrowly

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[1] The SADT numbers correspond to the numbers of definitions and figures by Systematic Association Committee for Descriptive Biological Terminology in Taxon **11**: 145–156, 245–247 (1962).

elliptic or ovate, 5–20 mm long 2.2–7 mm wide 9

9. Cauline leaves narrowly obovate or narrowly elliptic, remotely crenulate-denticulate to nearly entire along the margin, sparsely to moderately papillate above, epapillate beneath (the papilla 0.05–0.15 mm long). Inflorescence 10–50-flowered. Calyx epapillate, (3–)4–5(–5.5) mm long .... *S. himalense* (p. 355)

9. Cauline leaves usually ovate, entire or very shallowly repandous along the margin, very densely papillate (the papilla 0.2–0.3(–0.4) mm long). Inflorescence (3–)5–6(–7)-flowered. Calyx moderately papillate outside (the papilla 0.2–0.3 mm long), 2.5–3.8 mm long .... *S. Bouvieri* (p. 360)

6. Rhizome usually lacking the remains of the former years' old flowering stem or if some former year's stems present, then not tufted. Annotinous flowering stems 1–15 [Subsect. Rhodiola] 10

10. Flowers hermaphrodite, the pistil opposite to the petal...... 11

11. Calyx-lobes 1.5–3.5 mm long. Gynoecia 5–10 mm long. Hypogaeous part of rhizome creeping and 2–10 mm across 12

12. Leaves aggregated on the upper 1/4–1/3 parts of the stem, ovate to oblong-obovate, more or less deeply imparilobulate or sinuolate. Calyx-lobes 1.5–2.5 mm long. Petals very narrowly oblong-ovate .... *S. ovatisepalum* (p. 339)

12. Leaves alternately arranged throughout the stem. Calyx-lobes 2–3.3 or 3.5–5 mm long. Petals narrowly ovate to ovate or elliptic (in *S. linearifolium*) or narrowly obovate (in *S. sacrum*) 13

13. Leaves very narrowly obovate to linear-obovate, more or less deeply lobulate at the upper a third to nearly entire along the margin. Calyx-lobes 2–3.3 mm long. Petals narrowly ovate to ovate or elliptic, (6–)7–11(–12) mm long, 2–4 mm wide .... *S. linearifolium* (p. 333)

13. Leaves ovate to oblong-ovate or elliptic, crenulate-serrate or minutely lobulate along the margin. Calyx-lobes 3.5–5 mm long. Petals narrowly obovate, 5–7 mm long 1.2–2 mm wide .... *S. sacrum* (p. 342)

11. Calyx-lobes 4–8 mm long. Gynoecia 9–18 mm long. Hypogaeous part of rhizome erect to ascending and 6–10 mm across (in *S. nepalicum*) or 20–30 mm across, and the hypogaeous part creeping (in *S. Wallichianum*) 14

14. Leaves linear to very narrowly ovate (SADT n. 36) or very narrowly elliptic (SADT n. 1), remotely and irregularly crenulate, 1.2–3 cm long 0.12–0.6 cm wide. Rhizomes usually 2–3 cm across, the hypogaeous part creeping. Flowering stem usually epapillate but rarely papillate on the upper part. The papilla about 0.1 mm long .... *S. Wallichianum* (p. 313)

14. Leaves narrowly elliptic (SADT n. 2) or narrowly ovate (SADT n. 37), 5- or 7-lobulate or remotely crenulate-serrate, 1–4 cm long 0.6–1.5 cm wide. Rhizome 0.6–1 cm across, the hypogaeous part ascending or erect. Flowering stem always densely to moderately papillate. The papilla 0.2–0.3 mm long .... *S. nepalicum* (p. 318)

10. Flowers dioecious, in the female the pistils opposite to the calyx-lobes 15

15. Rhizome slender, usually 0.2–0.4 cm across, surculose. Flowering stem 0.7–1.1 mm thick. Leaves usually linear or very narrowly elliptic (SADT n. 1) or linear-obovate, (0.6–)0.7–1(–1.4) cm long 0.15–0.25(–0.28) cm wide .. .. *S. Cretini* (p. 316)

15. Rhizome subcylindrical to long ovoidal, (excepting *S. discolor*) 1–3 cm across, not producing suckers. Flowering stem 1–9 mm thick. Leaves variable in shape, 0.3–0.9–9.5 cm long (0.2–)0.4–4.5 cm wide 16

16. Inflorescence mostly ebractate, exposed in the flowering time, the primary inflorescence-axis consisting of the connection of 2–7 pedicels and often a part of peduncles. Flowers sessile, usually coherent or often connate .... *S. heterodontum* (p. 304)

16. Inflorescence more or less to densely bracteate, involucrate or rarely exposed, the inflorescence-axis not connate. Flowers more or less sessile to long pedicellate 17

17. Leaves nearly opposite, (narrowly to normally) rhombic-ovate or narrowly elliptic. Inflorescence forming a lax compound-dichasium .... *S. callianthum* (p. 331)

17. Leaves alternate, variable in shape excepting rhombic-ovate shape. Inflorescence forming a compound-corymb or simple corymb-fascicles 18

18. The ovaries straight and not conspicuously outcurved in the upper part. The former year's dead stems remaining in male as well as in female 19

19. Leaves typically to broadly elliptic (SADT n. 4 or 5), 1–3.3 cm long 0.55–1.7 cm wide, usually minutely crenulate to erose but rarely nearly entire along the margin, round at the apex, indistinctly petiolate, the petioles 0.8–2 mm long. The remains of the dead flowering stems dark purplish-brown, often shining .... *S. crenulatum* (p. 308)

19. Leaves very narrowly obovate (SADT n. 45) to narrowly elliptic (SADT n. 1—2) or ovate (SADT n. 38), 2–3 cm long 0.3–0.7 cm wide, nearly entire to remotely denticulate along the margin of the upper half, acute at the apex, sessile. The remains of the dead flowering stems stramineous .... *S. imbricatum* (p. 306)

18. The ovaries straight but abruptly and conspicuously outcurved in the upper part. The former year's dead flowering stems not persistent in male but rarely persistent in female 20

20. Rhizome slender, well branched, 0.7–1.4 cm across, ascending or creeping. Petals 5–6 (♂) or 3–4 (♀) mm long, 1.7–2 (♂) or 0.9–1.2 (♂) mm wide. Leaves more or less to conspicuously glaucous beneath .... *S. discolor* (p. 327)

20. Rhizome usually obconical or massive, sparsely branched in well developed state, 1–3 cm across, ascending or erect. Petals 2.8–4 (♂) or 1.5–3 (♀) mm long, 1.2–1.6 (♂) or 0.5–0.7 (♀) mm wide. Leaves hardly glaucous .... *S. bupleuroides* (p. 320)

Sect. **Hobsonia** H. Ohba, sect. nov.

Sect. Rhodiola ser. Primuloides Praeger group 2. Brevicaules Praeger in Journ. Roy. Hort. Soc. **46**: 27 (1921).

Sect. Rhodiola subsect. Primuloidea (Praeg.) Berger § 5. Brevicaulia (Praeg.) Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 443 (1930), nonnisi *S. Hobsonii*, excl. cet. sp. cit.

Sect. Rhodiola group 1. Primuloides Fröd. in Act. Hort. Gothob. **5**: append. 21 (1930), nonnisi *S. Hobsonii*, excl. cet. sp. cit.

Anthera dorsifixa, loculis duobus ad filamentum parallelis, per anthesin loculorum scissuris ventralibus per totam longitudinem loculi dehiscentibus. Flores in drepanio terminali dispositi. Squamae dimorphae, eae majores apice accessione lineari vel oblonga.

Type species: *Sedum Hobsonii* Prain ex R.-Hamet.

This section is represented by the single species and is markedly characterized by the dorsifixed anther, helicoid cyme and dimorphic scaly leaves. In general appearance, the section is similar to sect. Primuloida, but is very unique in the anther and inflorescence. The dorsifixed anther is an intermediate form between versatile and basifixed.

Sedum Hobsonii Prain ex R.-Hamet in Kew Bull. **1913**: 154 (1913) et in Act. Hort. Gothob. **2**: 330 (1926)–Fröd. in Act. Hort. Gothob. **5**: append. 23 (1930)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 443 (1930). [Fig. 35]

Sedum Praegerianum W. W. Smith in Not. Bot. Gard. Edinb. **8**: 348 (1915). Praeger in Trans. Bot. Soc. Edinb. **27**: 107 (1917); in Journ. Roy. Hort. Soc. **46**: 69 (1921); in Not. Bot. Gard. Edinb. **13**: 91 (1921).

Rhodiola Hobsonii (Prain ex R.-Hamet) Fu in Act. Phytotax. Sin. Addit. **1**: 118 (1965).

Sedum mirabile H. Ohba in Journ. Jap. Bot. **49**: 257, fig. 1 (1974).

A perennial herb, usually 7–12 cm high. Roots dauciformed or tuber, usually 6–8 mm across, fleshy, usually 10–20 cm long. Rhizomes thick, usually 10–15 mm across, 1–5 cm long, erect, more or less epigaeous, fleshy, usually simple but when well developed branched, glabrous, the base tapering to the root, the apical part armed by dense scaly and radical leaves. Scaly leaves very densely arranged, chartaceous, more or less persistent; the outer ones rigidulous, usually broadly triangular-ovate or triangular-semicircular, attenuate at the apex, entire along the margin, usually 3–6 mm long 4–5 mm wide, round outside, usually chestnut- or lightbrown; the inner ones usually triangular-ovate or triangular-oblong with linear or oblong appendage at the apex, usually 2.5–5 mm long (excluding the apical appendage), 2–4 mm wide, entire along the margin, chestnut or bright-brown, round outside, the apical appendage 1–1.5 mm long 0.4–0.6 mm wide, round at the apex, more or less fleshy. Radical leaves green, fleshy, flattish, more or less long to shortly petiolate, deciduous, the petiole 7–10 mm long, flat, gradually broadening from the lower 1/3–1/2 toward the base, the broadening part 2.5–3.5 mm long 2–4 mm wide at the base, the other part about 1.5 mm wide, the lamina narrowly ovate (SADT n. 37) or linear-ovate, 7.5–10 mm long 3.2–4 mm wide, usually obtuse at the apex, entire along the margin. Flowering stem 2–18 in number, annual, ascending, glabrous, nearly epapillate, (5–)7–12(–15) cm long, about 1–1.8 mm across, nearly terete, simple, more or less fleshy, the former year's flowering stems hardly persistent. Leaves alternate, slightly remotely arranged throughout the stem, spreading widely, sessile, nearly spurless, flattish, spathulate, narrowly obovate (SADT n. 45), trullate (SADT n. 56) or narrowly oblong-ovate except ones at the lower 2–4 nodes, usually 6–15 mm long 2–4.5 mm wide, usually shortly attenuate at the base, acutely obtuse to round at the apex, entire and often mamillate along the margin (the mamilla less than 0.05 mm long), the both surfaces glabrous and hardly mamillate, the costa not prominent, the lateral veins 3–5 on each side of the costa, diverging; the leaves near the base similar to the scaly leaves, narrowly triangular or triangular-ovate, 2–2.5 mm long 0.6–1 mm wide, usually brownish. Inflorescences terminal, forming a helicoid cyme, usually 5–10-flowered, 0.7–3.5 cm long 1.2–4.5 cm wide, bracteate; bracts leafy, similar to the upper cauline leaves, 3–11 mm long 1.5–5 mm wide; peduncles 1.2–5 mm long, terete, glabrous, hardly papillate; pedicels very short, usually 0.5–1.5 mm long at anthesis, after anthesis elongate, up to 1.5–4 mm long. Flowers in late August to September, hermaphrodite, mostly 5-merous, usually 7–9 mm across at anthesis. Calyx 4.4–7 mm long, more or less fleshy, glabrous, epapillate, the tube nearly funnel-shaped, 0.8–3 mm long; the lobes 3.5–5.2 mm long 1.5–2.2 mm wide, nearly 1/2–3/5 as long as the petal, narrowly triangular-ovate or long ovate, long acuminate to acuminate or acute at the apex (with very minutely mucronulate appendage outside), nearly entire but in the upper half very minutely erose along the margin, very slightly imbricate, nearly flat inside, hardly round outside, green but at least in anthesis pink, the sinus between the lobes round. Petals distinct, 5.5–7.6 mm long 2–3 mm wide, mostly pink, more or less fleshy, usually narrowly ovate or oblong-elliptic, round but often with a very minute mucronulate appendage at the apex, nearly entire along the margin, but under binocular (× ca. 30 in magnification) often minutely erose in the upper 1/3 of the margin, obtusely keeled outside, wholly flat inside, erect or nearly erect at anthesis. Stamens usually shorter than the petal, erect at anthesis; filaments fleshy, obcompressed, nearly linear, about 0.5 mm wide at the base, glabrous, pinkish, the epipetalous ones inserted 2.5–3.5 mm from the base, 2.6–4 mm long, the alternipetalous ones 5.2–6.3 mm long; anthers dorsifixed, dehiscing longitudinally by two slits on ventral side, with two anther cells, slightly obcompressed, ovoidal or ellipsoidal, round with a minute projection (about 0.2 mm long) at the apex, 0.7–1.2 mm long, before anthesis deep purplish red, after dehiscence yellow. Nectar-scales usually oblong in dorsal view, very narrowly obovate or clavate in lateral view, (0.5–)0.8–1 mm long 0.4–0.6 m wide, about 0.3 mm thick, round to erose at the apex, reddish. Gynoecium 5.5–7.5 mm long, erect, nearly equalling the petal in length, connected ventrally 1.3–1.9 mm from the base, the ovary slightly bent toward the base ventrally, dorsally somewhat keeled and more or less humped, about 1.5 mm wide, tapering to styles; the style mostly 1.2–2 mm long, usually straight, tapering; the stigma incon-

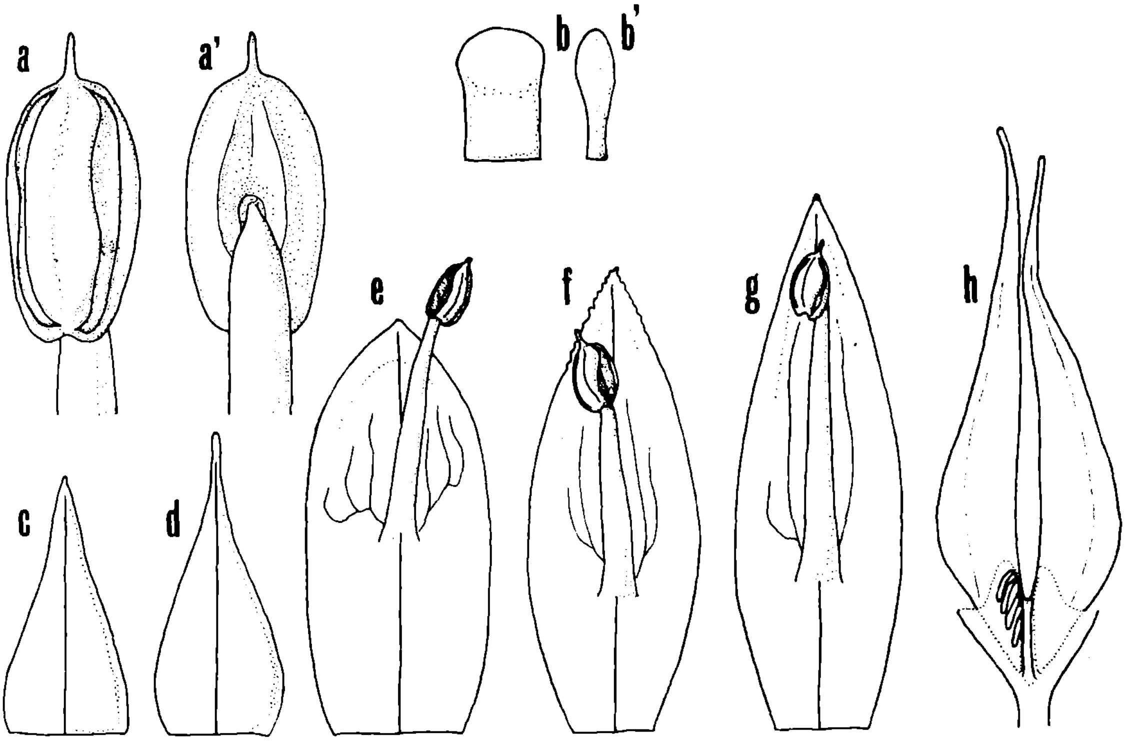

Fig. 35. *Sedum Hobsonii* R.-Hamet. a. Anther in ventral and dorsal (a') view, ×30. b. Nectar-scale in dorsal and lateral (b') views, ×15. c, d. Calyx-lobes, ×7.5. e–g. Petals with stamen, ×7.5. h. Pistils in lateral view, ×7.5. (a, d & f–h. Rohmoo Lepcha 137, b–c & e. Bowes-Lyon 5071).

spicuous, epapillate; the placenta nearly marginal, 2–3 mm long, situated 1.3 mm above the ovary-base. Ovules 10–24 in each locule, ascending to declined, usually 0.6–0.8 mm long, oblong, round at the apex, the funicles usually 0.3–0.4 mm long. Follicles 6–8 mm long, brownish, erect. Seeds oblong, usually 1–1.3 mm long 0.2–0.3 mm wide, light brown.

Distr. Bhutan and Tibet.

Specimens examined. Tibet. Yatung (H. E. Hobson s.n. K–Holotype of *Sedum Hobsonii* Prain ex R.-Hamet); Chumbi, Gum-bo-teen, 2000 ft. above Chumbi. Flowers red (Dungboo s.n. in July 1878, CAL); Chumbi. Flowers red (Cooper 711, E); Tarkapo, Chumbi Valley, alt. 12000 ft. (Rohmoo Lepcha 137, E–Holotype of *S. Praegerianum* W. W. Smith, CAL–Isotype); Galing at the Mochu river, above Chumbi (Dungboo 4638, CAL); loc. cit. (King 4638, CAL). Bhutan. Kopul Puwthang, alt. 10500 ft. On mossy rocks. Red. fls. (Cooper 2131, E); Sinchu La, alt. 10500 ft. Cliff face. Pink flower (S. Bowes-Lyon 5071, BM–Holotype of *S. mirabile* H. Ohba); Tzatogang–Dotanang, alt. 2800 m. On rock (Kanai, Murata, Ohashi, Tanaka & Yamazaki 1776, TI).

This species is very remarkable in having the dorsifixed anthers and helicoid cyme. The identity of *S. Praegerianum* with *S. Hobsonii* was already discussed in detail by R.-Hamet (1926). *S. mirabile* was proposed as a new species mainly upon its dorsifixed anthers, but there are no differences between *S. mirabile* and *S. Hobsonii* including *S. Praegerianum.*

Sect. **Primuloida** (Praeg.) H. Ohba, stat. nov.

Sect. Rhodiola ser. Primuloides Praeger in Journ. Roy. Hort. Soc. **46**: 27 (1921), pro parte, excl. group 2. Brevicaules Praeg.

Sect. Rhodiola subsect. Primuloidea (Praeg.) Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 443 (1930), pro parte, excl. *S. sikokianum, S. Durisii, S. Prainii, S. Hobsonii* et *S. Balfouri* in § 5. Brevicaulia.

Sect. Rhodiola group 1. Primuloides Fröd. in Act. Hort. Gothob. **5**: append. 21 (1930), pro parte.

Anthera basifixa. Folia radicalia adsunt. Planta pumila vel saepe pulvinaque caespitosa.

Type species: *Sedum primuloides* Franchet (lectotype).

This section is characterized mainly by the radical leaves, and includes the six species as follows: *S. primuloides* Franch., *S. pleurogynantheum* Hand.-Mzt., *S. pachyclados* Aitch. et Hemsl., *S. nuristanense* Kitamura, *S. Karpelesae* R.-Hamet, and *S. humile* Hook. f. et Thoms. emend. R.-Hamet. The section ranges from Afghanistan through Nepal, Sikkim, Tibet, and Yunnan to Szechuan, but is not recorded from Bhutan. In eastern Himalaya the section is represented by the following species.

Sedum humile Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 99 (1858), pro parte–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 419 (1878), pro parte–W. W. Smith & Cave in Rec. Bot. Sur. Ind. **4**: 197 (1911)–Praeger in Not. Bot. Gard. Edinb. **13**: 84 (1921)–R.-Hamet in Bull. Soc. Bot. France **72**: 63 (1925), emend.–Fröd. in Act. Hort. Gothob. **5**: append. 21 (1930); in Ark. Bot. **30**A(9): 1 (1943). [Fig. 36]

Sedum Levii R.-Hamet in Bull. Soc. Bot. France **56**: 568 (1909)-Berger in Engl. & Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 443 (1930).

Sedum Barnesianum Praeger in Not. Bot. Gard. Edinb. **13**: 72 (1921)-Berger, l.c. 443 (1930).

Chamaerhodiola humilis (Hook. f. et Thoms.) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 30 (1934).

Rhodiola humilis (Hook. f. et Thoms.) Fu in Act. Phytotax. Sin. Addit. **1**: 119 (1965).

A perennial herb, usually 2–3 cm high. Rhizomes thick, fleshy, cylindrical or rarely dauciformed, 1.5–2 cm long, usually 0.5–1.5 cm across, erect, more or less epigaeous, usually simple but branched when well developed, glabrous, having a rather slender root at the base, the apical part densely clothed with scaly leaves and the remains of the petiolar part of the former years' radical leaves. Scaly leaves erect, chartaceous, rigidulous, more or less persistent, subulate, usually 2–5 mm long 0.7–0.9 mm wide, rusty or chestnut-brown, entire along the margin, round and shortly apiculate at the apex. Radical leaves usually 10–20 in number, erect, annual, long-petiolate; the petiole (5–)8–18 mm long 0.4–1 mm wide, linear but very slightly broadening toward the base, flat, slightly brownish green; the lamina 3–8 mm long 1.2–2.3 mm wide, flat, linear-elliptic, very narrowly rhombic-ovate or very narrowly obovate (SADT n. 45), entire along the margin, round or obtuse at the apex, long-attenuate at the base, green, glabrous, epapillate; the former years' dead petioles degenerated into scaly appendages, long persistent, densely tufted, rigescent, blackish or chestnut-brown, somewhat lustrous. Flowering stems (2–)3–5(–6) in number, annual, erect but in the upper half abruptly bent outward, greenish(?), glabrous, nearly epapillate, 1.5–4 cm long, about 0.9 mm across, nearly terete, simple, not fleshy, the dead flowering stem not remaining. Leaves alternate, more or less remotely arranged throughout the stem, spreading widely, nearly spurless, sessile, flattish, linear-ovate or linear-elliptic, 4.5–9.5 mm long 0.9–2.3 mm wide, usually round but rarely acutely obtuse at the apex, attenuate at the base, entire along the margin, glabrous, epapillate, somewhat yellowish green, the costa not prominent, the lateral veins nearly parallel, 3–4 on each side of the costa. Flowers in August and September, hermaphrodite, mostly 5-merous, usually 8–11 mm across at anthesis, usually solitary but rarely forming a small corymb, the inflorescence 2–4-flowered, bracteate; the bract leafy, linear-elliptic, 3–6 mm long 0.6–1.5 mm wide; peduncles and pedicels 1.2–2 mm long. Calyx 3.2–5 mm long, more or less fleshy, green, glabrous, epapillate; the tube nearly funnel-shaped, 0.6–1.5 mm long; the lobes ovate, 2.6–3.5 mm long 1.7–2.5 mm wide, obtuse or acuminate in the apical part, obtuse or round at the apex, nearly entire along the margin, very slightly imbricate, rather flattish, [ascending at anthesis; the sinus between the lobes round. Petals distinct, 5–6.5 mm long 1.7–2.7 mm wide, mostly white, more or less fleshy, oblong-ovate or ovate with a round apex, entire along the margin, in the lower 1/4–1/3 flattish, in the upper 2/3–3/4 boat-shaped, ascending at anthesis. Stamens always shorter than the petal, nearly erect at anthesis; filaments linear-subulate, somewhat fleshy, obcompressed, 0.3–0.5 mm wide at the base, glabrous, whitish, the epipetalous ones inserted

1–1.7 mm from the base, 1.7–3.3 mm long, the alternipetalous ones 3–5 mm long; anthers basifixed, ovoidal or globosal, round at the apex, 0.6–0.8 mm long, before anthesis reddish, after dehiscence turning yellow. Nectar-scales transversely oblong (SADT n. 21) or depressed ovate (SADT n. 44) or rarely square, usually 0.5–0.9 mm long 0.8–1.5 mm wide, about 0.15 mm thick, often slightly retuse at the apex, probably reddish, more or less adnate to the ovary. Gynoecium 4–7.5 mm long, erect, usually slightly longer than the petal, connected ventrally 1–1.5 mm from the base, whitish, the ovary 1.2–1.7 mm wide, ventrally straight but in the upper part rather abruptly outcurved, dorsally more or less humped in the lower half and outcurved in the upper half, tapering to styles; the style 0.5–1.7 mm long, usually horizontal, tapering upwards; the stigma inconspicuous and epapillate; the placenta nearly marginal. Ovules usually 8–10 in each locule, mostly declined, usually 0.6–0.7 mm long, oblong, round at the apex, the funicles about 0.2 mm long.

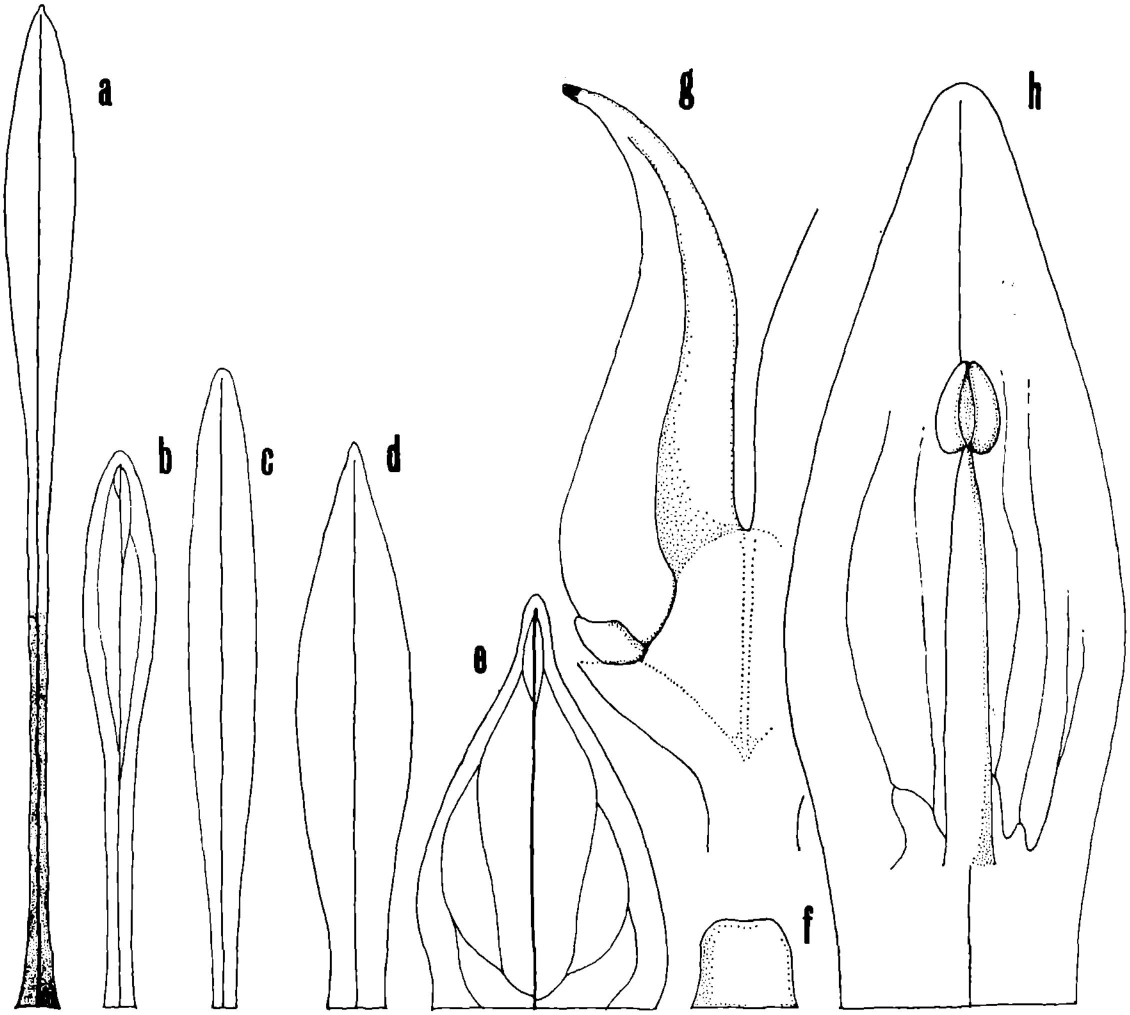

Fig. 36. *Sedum humile* Hook. f. et Thoms. emend. R.-Hamet. a & b. Radical leaves, ×3.75, c & d. Cauline leaves, ×7.5, e. Calyx-lobe, ×15, f. Nectar-scale in dorsal view, ×15, g. Pistil in lateral view, ×15, h. Petal with stamen, ×15. (a, c & g. Hooker s. n., b, d–f & h. Sharma E. 120).

Distr. Nepal, Sikkim, and Tibet.

Specimens examined. Nepal. Langdeng, alt. 7000 ft. Flowers white (Sharma E. 120, BM); Ya-La, Lantang Valley, alt. 3600 m (A. Maire s.n. on July 29, 1972, BM); Dagpache, alt. 16000 ft. Short turf. Perianth white, going pink, leaves fleshy (Polunin 1741, BM). Sikkim. Yeumtong, alt. 15000 ped (J. D. Hooker s.n. on Sept. 6, 1849, K (pro parte)–Lectotype of *Sedum humile* Hook. f. et Thoms. emend. R.-Hamet; CAL); Tunkra Pass (J. D. Hooker s.n., K–Syntype of *Sedum humile* Hook. f. et Thoms.). Tibet. Kalaeree, alt. 16000 ft. (Rohmoo Lepcha 434, E–Lectotype of *Sedum Barnesianum* Praeger); Phari, Chumbi Valley, alt. 14000 ft. (a native collector s.n. on Sept. 20, 1916, E–Syntype of *Sedum Barnesianum* Praeger); Numa, Dry ground (Stewart s.n., CAL); Phembula, 10–15 miles north of Lhasa (Walton s.n., CAL); above Singma Rhangcheng, alt. 11500 ft. (Chapman 618, K); Valley above Pongkar near Druk La Gompa, alt. 12–13000 ft. Abundant on cliff. Prostrate plant forming close mats on open turf banks. Flowers cream, turning reddish later (Kingdon-Ward 6122, K).

The circumscription of this species remained to be obscure until 1925, when R.-Hamet emended Hook. f. and Thomson's sense of *Sedum humile* based on the re-examination of the original material. *S. humile* emended R.-Hamet differs greatly from *S. quadrifidum* Pallas in having radical leaves, numerous remains of petiole of the old year's radical leaves, hermaphrodite flowers and larger petals, i.e. 5–6.5 mm long and 1.7–2.7 mm wide against 2.5–3.5 mm long and 0.8–1.7 mm wide in *S. quadrifidum*. In general appearance, *S. humile* also resembles *S. Smithii*, but differs from the latter mainly in having radical leaves and in lacking heteromorphic scaly leaves, of which the inner ones have linear or oblong appendages at the apex (1.5–3 mm long and 0.3–0.8 mm wide in their size). The identity of *S. Levii* R.-Hamet and *S. Barnesianum* Praeger with *S. humile* was already discussed fully by Hamet (1925).

The typification of *S. humile* is somewhat problematic. In the original description of the species (1858), no specimen was cited. However, Clarke (1878) cited two Hooker's collections from Sikkim, i.e., Yeumtong and Tunkra Pass. It is certain that *S. humile* was discribed based especially on the specimen from Yeumtong. As already pointed out by Hamet (1925), all the rejectable part in the original description for the delimitation of *S. humile* is coincident with *S. quadrifidum*, and the collection from Yeumtong is a mixture of plants consisted of both *S. humile* emend. R.-Hamet and *S. quadrifidum* Pallas. It is preserved in Herbarium Hookerianum (K) and on this sheet there are 19 plants of which the 6 are *S. humile* and the other 13 are identical with *S. quadrifidum* Pallas. The specimen from Tunkra Pass was collected at relatively late flowering, but all the plants on the specimen are definitely *S. humile*. However, the specimen is very poor and lacks several important characters of the species. Therefore, it seems to be better to select the plant of *S. humile* collected from Yeumtong which I designated by an asterisk on the sheet as lectotype of *S. humile*.

Sect. **Smithia** H. Ohba, sect. nov.

Sect. Rhodiola subsect. Eurhodiola § 2. Himalensia Berger in Engl. et Prantl, Nat. Pfl.-fam 2 Aufl. **18**a: 442 (1930), nonnisi *S. Smithii*, excl. cet. sp. cit.

Sect. Rhodiola group 1. Primuloides Fröd. in Act. Hort. Gothob. **5**: append. 21 (1930), nonnisi *S. Smithii*, excl. cet. sp. cit.

Folia radicalia deficientia. Squamae dimorphae, eae majores apice appendiculatae; appendice lineari vel oblonga, 1.5–3 mm longa 0.3–0.8 mm lata. Flores hermaphroditi. Anthera basifixa.

Type species: *Sedum Smithii* R.-Hamet.

This section is represented by the single species. In general appearance it is very similar to sect. Primuloida, but distinctly differs from the latter in lacking foliaceous radical leaves.

Sedum Smithii R.-Hamet [in W. W. Smith in Rec. Bot. Surv. Ind. **4**: 259 (1911), nom. nud.] in Engl., Bot. Jahrb. **50**: Beibl. 112, 8 (1913); in Candollea **4**: 48 (1929), ut '*Smithi*'-Fröd. in Act. Hort. Gothob. **5**: append. 25 (1930), ut '*Smithi*'-Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930). [Fig. 37]

Sedum chumbicum Prain ex R.-Hamet in Candollea **4**: 48 (1929), pro syn.

Rhodiola Smithii (R.-Hamet) Fu in Act. Phytotax. Sin. Addit. **1**: 122 (1965).

A perennial small herb, usually 2–5 cm high. Roots dauciformed, fleshy, usually 5–8 mm across, 3–5 cm long. Rhizomes thick, usually 5–8 mm across, 5–8 mm long, erect, more or less epigaeous, fleshy, simple, glabrous, the base tapering to the root, the apical part densely covered with scaly leaves. Scaly leaves very densely arranged, chartaceous, rigidulous, more or less persistent; the outer ones usually triangular-ovate or triangular-semicircular but rarely triangular, usually long-acuminate but rarely deltoid at the apical part, mostly obtuse at the apex, entire along the margin, usually 5–8.5 mm long 3–5 mm wide, round outside, usually bright brown; the inner ones usually triangular-semicircular or triangular-ovate with linear or oblong appendage at the apex, usually 3.5–6 mm long (excluding the apical appendage), 2–3.5 mm wide, entire along the margin, chestnut or bright-brown except the apical part, round outside, the apical appendage usually 1.5–3 mm long 0.3–0.8 mm wide, usually pale brown or ivory white, obtuse or round at the apex, fleshy. Flowering stems (1–)2–3 in number, annual, ascending or suberect, arising from the axils of the innermost scaly leaf, glabrous, mostly epapillate, usually 1.7–7 cm long, about 1.7 mm across, nearly terete, simple, more or less fleshy, the former year's flowering stems not remaining. Leaves alternate, slightly remotely arranged throughout, spreading widely, spurless, sessile, flattish, linear-elliptic or linear-ovate, 4.5–14 mm long 1.1–2.2 mm wide, mostly round but rarely obtuse at the apex, nearly truncate or very shortly attenuate at the base, nearly entire along the margin, glabrous, hardly papillate or mamillate, yellowish (?) green, the costa not prominent, the lateral veins nearly parallel, 3–4 on each side of the costa. Inflorescences terminal, forming a small corymb, usually with 5–10 flowers, 5–20 mm long 10–35 mm wide, bracteate; bracts leafy, very similar to the cauline leaves but smaller, usually 3–8 mm long 0.8–1.7 mm wide; peduncles usually 2–3.8 mm long, terete, glabrous, epapillate; pedicels usually 0.3–1.5 mm long. Flowers in late July to early September(?), hermaphrodite, mostly 5-merous, usually 4–5 mm across at anthesis. Calyx 3.1–5.3 mm long, thick, glabrous, epapillate; the tube saucer- or funnel-shaped, 0.7–

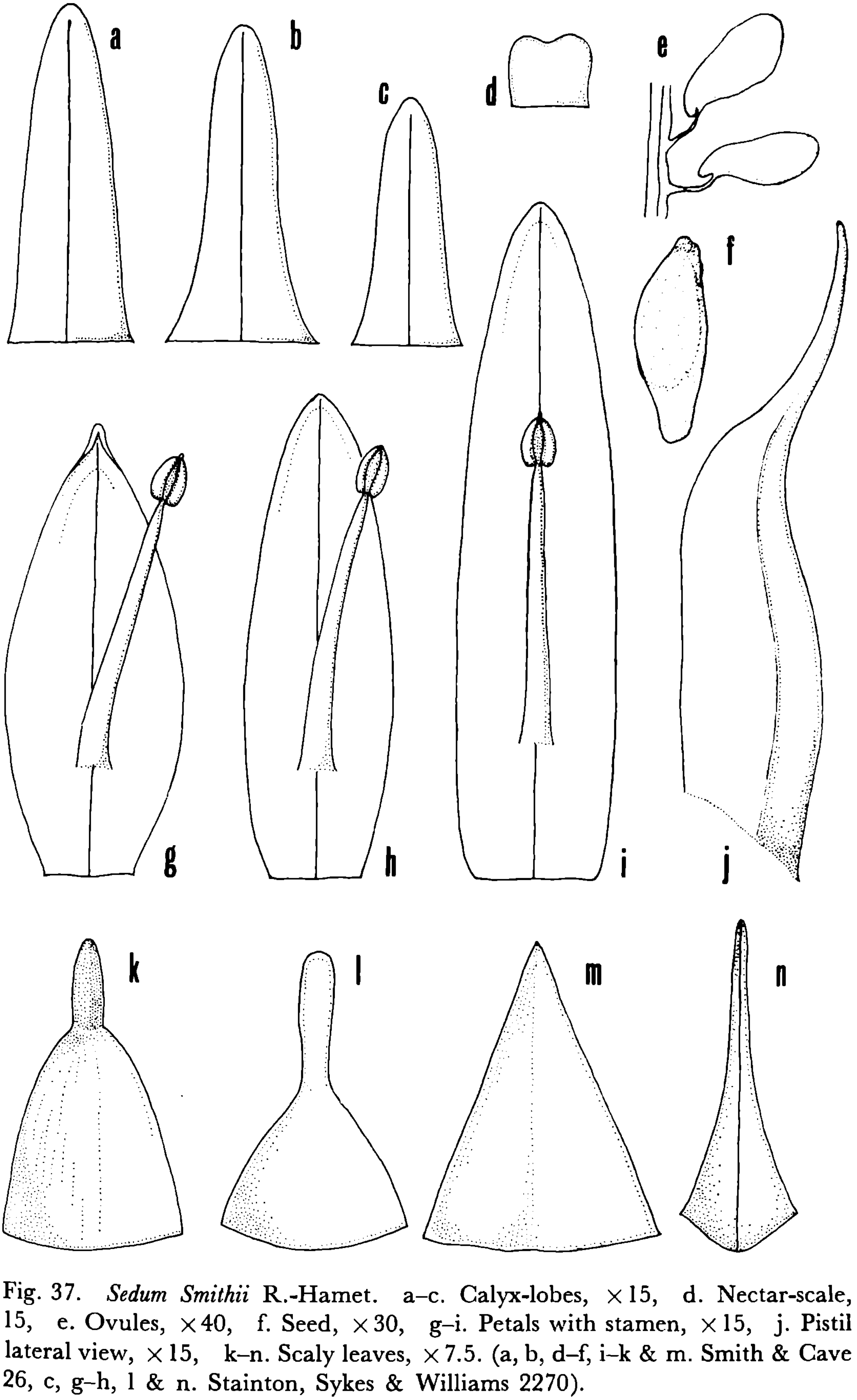

Fig. 37. *Sedum Smithii* R.-Hamet. a–c. Calyx-lobes, × 15, d. Nectar-scale, × 15, e. Ovules, × 40, f. Seed, × 30, g–i. Petals with stamen, × 15, j. Pistil in lateral view, × 15, k–n. Scaly leaves, × 7.5. (a, b, d–f, i–k & m. Smith & Cave 2126, c, g–h, l & n. Stainton, Sykes & Williams 2270).

1.2 mm long; the lobes nearly 1/3 as long as petal, 2.4–4 mm long 0.7–1.5 mm wide, linear-ovate or very narrowly oblong, round in the apical part, round or obtuse at the apex, slightly round outside, flattish inside, entire along the margin, usually ascending at anthesis, green but often pinkish or reddish; the sinus between the lobes round or obtuse. Petals distinct, 3.7–6.5 mm long 1.4–2 mm wide, mostly(?) pink, usually linear-ovate but rarely narrowly ovate (SADT n. 37), entire along the margin, round in the apical part, round or obtuse at the apex, rather thin, shallowly boat-shaped, suberect or ascending at anthesis. Stamens shorter than the petal, erect at anthesis; filaments long subulate, slightly thick, flat, usually(?) pinkish, about 0.4 mm wide at the base, the epipetalous ones inserted 1–1.5 mm from the base, 1.6–3.2 mm long, the alternipetalous ones 2.7–5.2 mm long; anthers basifixed, oblong-ovoidal, round and having a minute projection (about 0.1 mm long) at the apex, usually 0.5–0.7 mm long, before anthesis reddish, after dehiscence turning yellow. Nectar-scales usually transversely broadly oblong (SADT n. 19) but rarely square, mostly emarginate at the apex, 0.4–0.6 mm long 0.5–0.9 mm wide 0.2 mm thick, flattish, probably reddish. Gynoecium 3.6–7.4 mm long, nearly equalling or slightly longer than the petal, connected ventrally 0.5–0.9 mm from the base, erect, pale green (?), the ovary straight ventrally but in the upper part more or less outcurved, usually convex dorsally, usually broadest at the middle but rarely near the base (usually 0.7–1.5 mm), the style 1.4–2 mm long, tapering from the ovary, usually slightly incurved near the middle, the stigma inconspicuous, hardly papillate; the placenta nearly marginal. Ovules 4–8 in each locule, ascending to descending, narrowly oblong-ovoidal, usually 0.6–0.7 mm long, round at the apex, the funicles 0.6 mm long, filiform.

Distr. Nepal, Sikkim, and Tibet.

Specimens examined. Nepal. Damodar Kund, N. of Muktinath, alt. 14000 ft. Dry stony slopes. Calyx, corolla, filaments and anthers pink (Stainton, Sykes & Williams 2112, BM); Namdo, N. of Mustang, alt. 15500 ft. Open stony slopes. Petals, filaments, anthers and stem pink (Stainton, Sykes & Williams 2270, BM). Sikkim. Llonok, alt. 15000 ft. (W. W. Smith & G. H. Cave 2126, CAL-Isotype of *Sedum Smithii* R.-Hamet). Tibet. Cyangtse (Walton s.n., CAL); Chumbi, Wo Tho (Dungboo s.n., CAL, *S. chumbicum* Prain in sched.); Ten. . . . Zong, alt. 14500 ft. (Lloyd 102, K).

Sect. **Prainia** H. Ohba, sect. nov.

Sect. Rhodiola subsect. Primuloidea (Praeger) Berger § 5. Brevicaulia Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 443 (1930), nonnisi *S. Prainii*, excl. ceteris spec. cit.

Sect. Seda genuia § 4. Stapfiana Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 450 (1930), nonnisi *S. Stapfii*, excl. ceteris spec. cit.

Sect. Rhodiola group 1. Primuloides Fröd. in Act. Hort. Gothob. **5**: append. 21 (1930), pro minute parte.

Folia numero 4 to 6, verticillata; ea radicalia deficientia. Squamae unimorphae, sine appendice. Flores hermaphroditi aut dioecii. Anthera basifixa.

Type species: *Sedum Prainii* R.-Hamet.

This section includes two species, i.e. *S. Prainii* R.-Hamet and *S. Stapfii* R.-Hamet, and is characterized by the nearly verticillate 4–6 leaves. By lacking both radical leaves and dimorphic scaly leaves, the section is easily distinguished from the sect. Primuloida and the sect. Smithia.

Sedum Prainii R.-Hamet in Bull. Soc. Bot. France **56**: 566 (1909); in Candollea **4**: 44 (1929), ut '*Praini*'-Fröd. in Act. Hort. Gothob. **5**: append. 26 (1930)-Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 443 (1930). [Plate 10d; Fig. 38]

Sedum Stewartii Craib ex R.-Hamet in Candollea **4**: 44 (1929), pro syn.

Sedum apiculatum Craib ex R.-Hamet in Candollea **4**: 44 (1929), pro syn.

A small perennial herb, up to 3 cm high. Rhizomes thick, usually 1.5–2 cm across, 2–3 cm long, erect, more or less epigaeous, the apical part densely covered with scaly leaves. Scaly leaves subulate to very narrowly triangular, chartaceous, rigidulous, persistent, usually 6–8 mm long 1–3.2 mm wide, entire along the margin, mostly very acute at the apex, erect or ascending, blackish or chestnut-brown. Flowering stems solitary, annual, erect, simple, fleshy, terete, glabrous but densely or sparsely papillate or mamillate (the projection less than 0.1 mm long, pellucid), usually 1.5–3 cm long, mostly 2 mm across, the old flowering stems not remaining. Leaves usually 4, nearly verticillate in the lower half of the stem, spreading, spurless, petiolate; the petiole usually 1–3 cm long, 1.3–1.6 mm wide near the base, flattish, glabrous; the lamina oblong-elliptic, elliptic to transversely broadly elliptic (SADT n. 4–7) or ovate to broadly ovate (SADT n. 39–40), usually 2–6 cm long 2.5–4 cm wide, usually round or rarely retuse at the apex, usually very long to rather shortly attenuate or rarely shallowly cordate at the base, nearly entire along the margin, fleshy, flattish, glabrous but moderately or sparsely papillate on both surfaces (including the petiole), densely or moderately papillate along the margin (the papilla capitate, pellucid, about 0.1 mm long), green but often reddish beneath and along the veins above, the costa not prominent, the lateral veins usually 3–4 on each side of the costa, nearly parallel to diverging. Inflorescences terminal, usually hemispherical, 1–2.5 cm across, conspicuously bracteate, forming a corymb or a corymbosely compound-dichasium, usually 13–18-flowered; bracts leafy, flattish, broadly elliptic to circular or ovate, entire along the margin, mostly round but rarely obtuse at the apex, attenuate at the base, often petiolate but usually sessile, the petiole 1.2–3 mm long, the lamina 5–17 mm long 3–8 mm wide in petiolate bracts, 2.4–5 mm long 0.8–3 mm wide in sessile ones, peduncles and pedicels mostly glabrous, nearly terete, usually 1.3–2.5 mm long. Flowers in August to September, hermaphrodite, usually 5- but rarely 6-merous, 4–5 mm across at anthesis. Calyx usually 4–6 mm long, more or less fleshy, generally reddish-green, glabrous, the tube saucer-shaped, 1.3–2.2 mm long, the lobes 1/2–2/3 as long as the petal, usually 2.5–3.7 mm long 1.5–2 mm wide, narrowly triangular-ovate or triangular-ovate, nearly entire along the margin, acute in the apical part, round at the apex, abruptly erect very near the base, round outside, in the lower 1/3 part slightly concaved but gradually flattish towards the apex inside, the sinus obtuse or acute. Petals distinct, 4–6.25 mm long 1.8–3 mm wide, minutely and irregularly erose along the margin, clearly imbricated, usually ovate, mostly acuminate or acute at the apex, more or less fleshy, shallowly boat-shaped, usually pale pink or greenish white, glabrous, erect at anthesis. Stamens shorter than the petal (nearly 3/4), erect at anthesis, usually pale pink; filaments fleshy, obcompressed, about 0.4 mm wide at the base, the epipetalous ones inserted about 0.8 mm from the base, 1.5–2.5 mm long, the alternipetalous ones usually 2–3.5 mm long; anthers basifixed, usually narrowly ovoidal, (0.6–)0.8–1.6 mm long, 0.4–0.7 mm across at the middle, usually obtuse at the apex, but often having a minute projection at the apex (as like as apiculate), before anthesis purplish red, after dehiscence turning yellow. Nectar-scales usually square, slightly round at the apex, often slightly recurved, probably reddish, 0.5–0.7 mm long 0.4–0.6 mm wide 0.3 mm thick. Gynoecium usually 3.5–5.2 mm long, distinctly shorter than the petal, connected ventrally 0.5–0.7 mm from the base, erect, usually slightly reddish, the ovary straight ventrally, round towards the apex from the middle dorsally, usually 1–1.5 mm wide at the middle, the styles rather slender, usually 0.6 mm long, nearly straight, the stigma epapillate, inconspicuous; the placenta nearly marginal. Ovules 14–18 or 34–40 in each locule, horizontal to descending, narrowly oblong-elliptic, round at the apex, usually 0.4 mm, the funicles about 0.1 mm long.

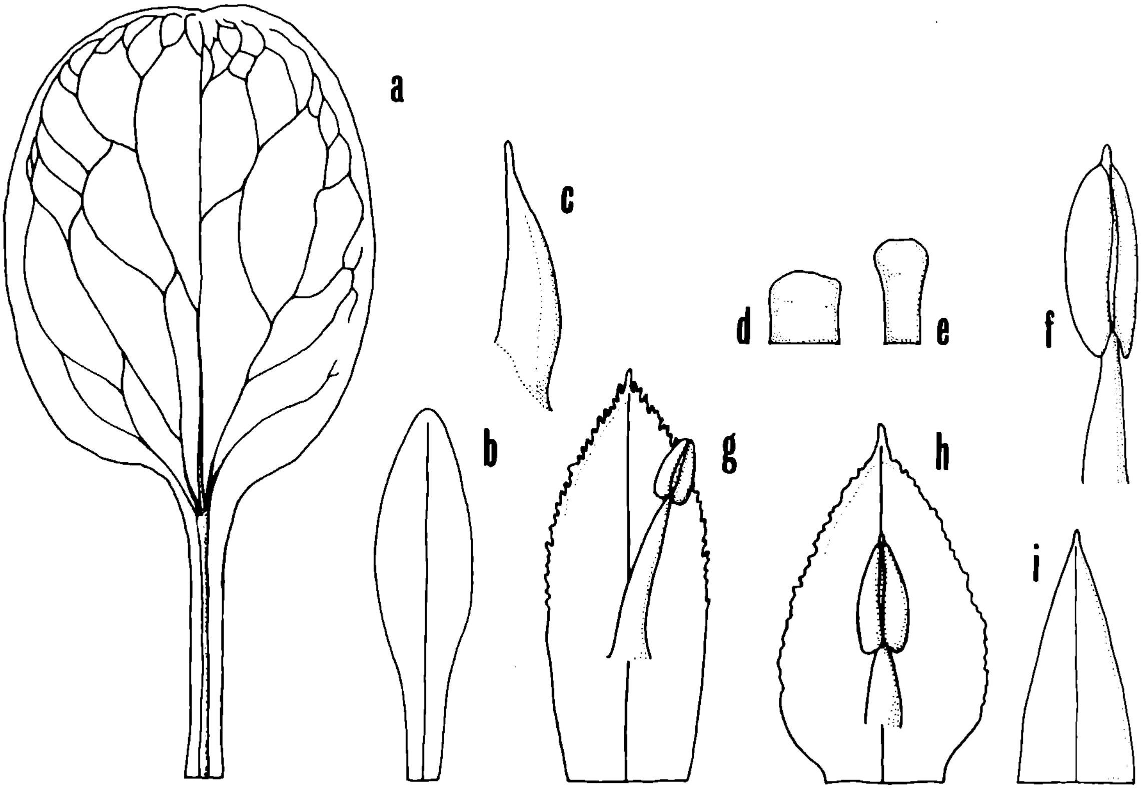

Fig. 38. *Sedum Prainii* R.-Hamet. a. Leaf, × 1, b. Bract, × 7.5, c. Pistil in lateral view, × 7.5, d & e. Nectar-scales in dorsal view, × 15, f. Anther, × 15, g & h. Petals with stamen, × 7.5, i. Calyx-lobe, × 7.5. (a, c, d, f, h & i. Polunin, Sykes & Williams 3800, b, e & g. Dhwoj 134).

Distr. Nepal, Sikkim, and Tibet.

Specimens examined. Nepal. Near Tarakot, Bheri River, alt. ca. 11000 ft. Among rooks, on ledges, etc. Leaves fleshy, veins red, undersides especially reddish. Buds reddish. Flowers greenish white (Polunin, Sykes & Williams 2447, BM, TNS); near Dogadi Khola, alt. 12000 ft. On boulders near river bed. Leaves reddish-green. Corolla very pale pink; anthers and calyx red (Polunin, Sykes & Williams 3800, BM, TI, KATH); Gokyo, 27°59′N, 86°41′E, alt. 4600 m (Dobremez 396, BM); Pharsey, alt. 14000–16000 ft. (Dhwoj 194, BM, E). Sikkim. Kambajong (Dr. Prain s.n. in Sept. 1903, CAL–Holotype of *S. Prainii* R.-Hamet).

The circumscription of this species described above somewhat differs from the original description by R.-Hamet (1909). The leaves described by R.-Hamet seem to correspond with a part of bracts in my description. After examining the holotype, I note here that his description of floral characters was based on an immature plant.

Sedum Prainii is clearly characterized by the relatively large and petiolate leaves, conspicuously bracteate inflorescences and hermaphrodite flowers. Superficially, this species resembles *S. filipes* Hemsley var. *major* Hemsley in having the large and fewer verticillate leaves. However, the latter belongs to the subgenus Sedum in lacking of rhizomes bearing scaly leaves, and there are no close relationships between the two.

Differences between *S. Prainii* and *S. Stapfii* will be mentioned in the latter's note.

Sedum Stapfii R.-Hamet in Kew Bull. **1913**: 156 (1913)–Praeger in Not. Bot. Gard. Edinb. **13**: 91, pl. 174, 3 (1921) in descript. *Sedi pseudo-Stapfii* Praeg.–Fröd. in Act. Hort. Gothob. **5**: append. 26 (1930); in Ark. Bot. **30**A(9): 2 (1943) -Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 450 (1930). [Fig. 39]

Rhodiola Stapfii (R.-Hamet) Fu in Act. Phytotax. Sin. Append. **1**: 122 (1965).

A perennial herb, up to 3 cm high. Rhizomes thick, about 8 mm across, erect, almost epigaeous, more or less densely scaly at the apical part. Scaly leaves chartaceous but more or less rigid, deciduous, long-triangular or narrowly triangular, often more or less concave and nearly entire along the margin, long-attenuate or acute at the apex, 0.7–12 mm long 1.8–4 mm wide, erect or ascending, mostly chestnut-brown. Flowering stem solitary, annual, erect, 1.4–2.5 cm long, simple, somewhat fleshy, terete, glabrous, sparsely to moderately mamillate (the mamilla about 0.1 mm long), about 1 mm across, the former years' flowering stems not remaining. Leaves usually 5 or 6, nearly verticillate at or near the top of the stem, ascending to spreading widely, spurless, glabrous, petiolate; the petiole usually 2–3.5 mm long 1.3–1.9 mm wide, broadly linear, more or less broadening towards the base; the lamina ovate (SADT n. 39) or oblong-ovate, usually 8–15 mm long 4–7 mm wide, usually obtuse at the apex, round at the base, entire along the margin, epapillate, more or less fleshy, usually somewhat glaucous beneath, the costa not prominent, the lateral veins 4–7 on each side of the costa, diverging. Inflorescences terminal, forming a small but long pedicellate, simple or monochasial corymb, (1–)3–6-flowered, ebracteate; peduncles of the monochasium about 5 mm long, glabrous, sparsely mamillate (the mamilla about 0.1 mm long), nearly terete; pedicels usually 10–13 mm long, glabrous, sparsely mamillate. Flowers in August, dioecious, 5-merous, 4–5 mm across at anthesis. Calyx 3.4–5 mm long, more or less fleshy, glabrous, the tube usually 0.9–1.5 mm long, the base tapering to the pedicel; the lobes slightly longer or shorter than the petal, usually 2.5–3.5 mm long 1.1–1.9 mm wide, linear to linear-triangular or narrowly triangular, nearly entire but usually moderately or densely mamillate (the mamilla about 0.1 mm long) along the margin, round or obtuse at the apex, often sparsely mamillate outside, slightly convex outside, flattish inside, ascending (♂) or erect and appressed to the ovary (♀) at anthesis. Petals 2.2–3.1 mm long 1–1.8 mm wide, distinct, usually narrowly oblong (SADT n. 14) or narrowly oblong-ovate or obovate, irregularly crenulate to erose (♂) or nearly entire (♀) along the margin, round at the apex, membranaceous, glabrous, ascending (♂) or suberect (♀) at anthesis, shallowly boat-shaped (♂) or flattish (♀). Stamens more or less shorter than the petal, nearly erect at anthesis; filaments subulate, nearly terete, fleshy, glabrous, about 0.3 mm wide at the base, the epipetalous ones inserted about 0.5 mm from the base, 1.3–2 mm long, the alternipetalous ones 1.8–2.3 mm long; anthers basifixed, nearly ovoidal, usually 0.6–0.8 mm long, obtuse and having a very minute projection (about 0.1 mm long) at the apex, before anthesis reddish (?), after dehiscence (?) yellow. Nectar-scales usually square to narrowly oblong, more or less round at the apex, reddish (?), 0.6–0.8 mm long 0.4–0.6 mm wide 0.15 mm thick. Gynoecium of female plants usually 4.5–5.2 mm long, distinctly longer than the petal, connected usually 0.9–1.2 mm ventrally from the base, erect, the ovary straight ventrally, slightly gibbose dorsally, usually 1.2–1.6 mm wide at the middle, narrowed and outcurved in the upper part, the style tapering toward the apex, conspicuously outcurved, usually 0.8–1 mm long, the stigma epapillate, inconspicuous; the placenta nearly marginal. Gynoecium of male plants about 1.5 mm long, distinctly shorter than

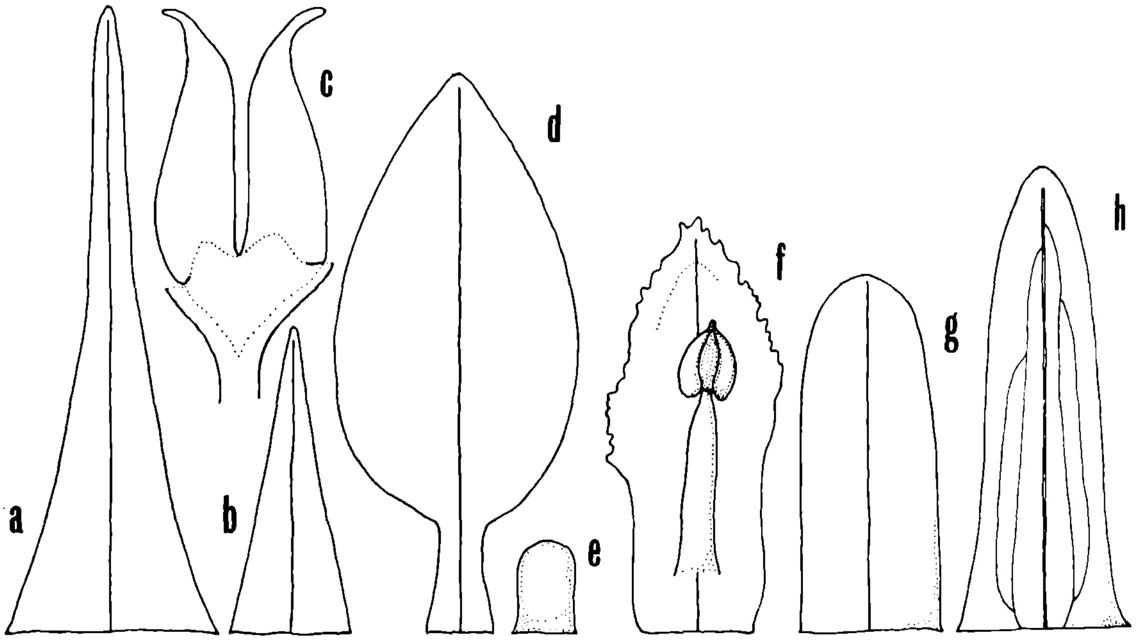

Fig. 39. *Sedum Stapfii* R.-Hamet. a & b. Scaly leaves, ×3.75, c. Pistils in lateral view, ×7.5, d. Leaf, ×3.75, e. Nectar-scale in dorsal view, ×15, f. Petal of male flower, ×15, g. Calyx-lobe, ×15, h. Petal of female flower, ×15. (a–d, g & h. Chapman 611, e & f. Gould 1012).

the stamens, sterile. Ovules mostly 8 in each locule, descending, oblong, about 0.5 mm long, round at the apex, the funicles about 0.1 mm long. Follicles nearly erect. Seeds ovoidal, slightly elongate in the apical part, round at the apex, 0.85–1 mm long, about 0.5 mm wide, the testa nearly smooth.

Distr. Tibet and Bhutan.

Specimen examined. Tibet. (King 318 ♀, K–Holotype of *Sedum Stapfii* R.-Hamet, CAL–Isotype); above Singma Khangcheng, alt. 11500 ft. (Chapman 611 ♀, K). Bhutan. Tremo La to Sharna, alt. 15000–9300 ft. (Gould 1012 ♂, K).

This is a rare but easily recognizable species by the relatively large and nearly verticillate leaves and long pedicellate flowers. This species has strong affinity to *Sedum Prainii*, but is different from the latter by the ebracteate inflorescence, longer pedicels, dioecious flowers and smaller leaves.

This species was compared with *S. pseudo-Stapfii* by Praeger in the latter's original description, but greatly differs from the latter in having rhizomes with scaly leaves.

Sect. **Rhodiola**: Scopoli in Fl. Carn. ed. 2, **1**: 326 (1771)-Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 95 (1858), pro parte-Maxim. in Bull. Acad. Sci. St. Pétersb. **29**: 124 (1883)-Praeger in Journ. Roy. Hort. Soc. **46**: 26 (1921), pro parte, excl. ser. Primuloides Praeger–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 430 (1930), pro parte, excl. subsect. Primuloidea (Praeg.) Berger–Fröd. in Act. Hort. Gothob. **5**: append. 16 (1930); **15**: 3 (1942), pro parte, excl. group 1. Primuloides.

Rhodiola sect. Eurhodiola A. Schrenk, Enum. Pl. Nov. **1**: 67 (1841).

Rhodiola sect. Chamaerhodiola A. Schrenk, loc. cit. 69 (1841).

Clemensia Rose in Bull. New York Bot. Gard. **3**: 3 (1903).

Chamaerhodiola (A. Schrenk) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 27 (1934).

Rhodiola sect. Clemensia (Rose) A. Boriss. in Komarov, Fl. USSR **9**: 28 (1939).

Scaly leaves relatively uniform, persistent or rather caducous. Radical leaves undeveloped. Cauline leaves more than 10, alternately arranged throughout the stem or aggregate. Flowers hermaphrodite or dioecious, anthers basifixed.

Type species: *Sedum roseum* (L.) Scopoli.

Subsect. **Rhodiola**

Sebsect. Eurhodiola (A. Schrenk) Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 430 (1930), excl. pro maj. parte in §2. Himalensia.

Sect. Rhodiola group 2. Chamae-Rhodiola, pro maj. parte, gr. 3. Eu-Rhodiola et gr. 4. Trifida Fröd. in Act. Hort. Gothob. **5**: append. 26 (1930).

Sect. Rhodiola group 3. Eu-Rhodiola Fröd. in loc cit. **15**: 3 (1942).

The former years' dead flowering stems not remaining, or if some former years' stems persistent, then not tufted. Annotinous flowering stems usually 1–6 or rarely more but less than 15 in number. Flowers hermaphrodite or dioecious.

This subsection ranges from N. Europe to N. America through Himalaya, N. W. China and N. E. Asia. In eastern Himalaya, I have recognized 12 species in this subsection.

Sedum heterodontum Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 95 (1858)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 417 (1878)–Maxim. in Bull. Acad. Sci. St.-Pétersb. **29**: 129 (1883), in adnota–Praeger in Journ. Roy. Hort. Soc. **46**: 34 (1921)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 440 (1930). [Fig. 40e–j]

Sedum Rhodiola DC. sensu Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 95 (1858)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 417 (1878), pro majore parte, excl. *Sedum imbricatum* Hook. f. et Thoms. et *Rhodiola imbricata* Edgew.

Sedum roseum (L.) Scop. var. *heterodontum* (Hook. f. et Thoms.) Fröd. in Act. Hort. Gothob. **5**: append. 40, Pl. 13, 2 (1930), ut '*heterodontum*', Fedtsch. pro parte; in Ark. Bot. **30**A(9): 4 (1943).

Rhodiola heterodonta (Hook. f. et Thoms.) A. Boriss. in Komarov, Fl. USSR **9**: 32 (1939), pro parte.

A perennial herb, up to 40 cm high. Rhizomes very thick, subcylindrical to narrowly ovoidal, solid, usually 2–3 cm across, accrescent, sparsely branched in well developed state, erect to suberect, the base tapering to the carrot-shaped root, the upper parts greyish brown, more or less epigaeous, marked by elliptic scars of flowering stems, and rather sparsely covered with scaly leaves. Scaly leaves brown, chartaceous, glabrous, more or less persistent, appressed to each axillary flowering stem, triangular-ovate to very broadly ovate with entire margin, obtuse or round at the apex, usually 3–6 mm long and wide. Flowering stems annual, 3–5 in number, erect, simple, robust, pale green and somewhat glaucous, glabrous, mostly epapillate, nearly terete, 10–25 cm long and 4–7 mm thick during the flowering time but after accrescent to 25–40 cm long and 6–10 mm thick, the old flowering stems not remaining. Leaves alternate, more or less remotely arranged throughout the flowering stem (but the internodes usually shorter than the leaf-length), sessile, nearly spurless, fleshy or thick herbaceous, flattish, glabrous, green above, pale green and somewhat glaucous beneath, usually 12–25 mm long 10–15 mm wide, 1–2.2 times longer than broad, triangular or triangular-, pentagonal- or broadly pentagonal-ovate, above deltoid-acuminate to round with an acute or obtuse apex, mostly shallowly cordate to more or less auriculate or rarely truncate at the base, coarsely 2–6(–7)-toothed or repandous to nearly entire along the margin (the teeth with obtuse or round apex, the sinus between teeth round), in dried specimens prominently white- or pellucid-margined, the costa not prominent, the lateral veins diverging and densely anastomosing towards the margin. Inflorescences terminal, a very dense and compact, capitellate, compound-corymbose, usually 80–120-flowered, mostly ebracteate, exposed in the flowering time, 1–2 cm high 2.5–3 cm wide in size; the primary axis of each corymb (consisting of the connection of 2–7 pedicels and often of a part of peduncles) 2–5 mm long, variable in thickness, glabrous, epapillate; bracts when present very similar to the upper cauline leaves in shape and size. Flowers in June and July, usually 4- or 5-merous, almost sessile, usually coherent [or rarely connate, dioecious. Calyx 3–4.5 mm long, glabrous, more or less fleshy, greenish, the tube about 0.5 mm long, tapering towards the base, the lobes 2.5–4 mm long, usually 0.6 mm wide, suberect at anthesis, valvate in bud, both surfaces flattish, usually linear with entire and slightly concaved margin, round at the apex, the sinus between lobes acute (♂) or truncate (♀), the veins not prominent. Petals distinct, valvate in bud, nearly erect (♂) or ascending (♀) at anthesis, very narrowly rhombic-elliptic to oblong or rarely linear in male, mostly linear in female, round or deltoid in the apical part, acute or obtuse (♂) or round (♀) at the apex, entire along the margin, 3.5–4.5 mm long 0.9–1.1 mm wide in male, 1.8–2.3 mm long 0.45–0.6 mm wide in female, glabrous, slightly round outside, concave (♂) or flattish (♀) inside, slightly yellowish or rarely greenish white but in dried specimens usually dull yellow. Stamens distinctly (more or less 2 times) longer than the petals, erect to suberect at anthesis; filaments filiform but scarcely tapering from the base, flattish, about 0.2 mm wide at the base, glabrous, usually pale green, 5.5–9 mm long, the oppositipetalous ones not inserted on the petal; anthers basifixed, ellipsoidal or nearly globosal, usually retuse at the apex, usually 0.7 mm long, before anthesis dull purplish red (?) and after dehiscence turning yellowish. Nectar-scales usually oblong, round or retuse at the apex, slightly concave ventrally and more or less convex

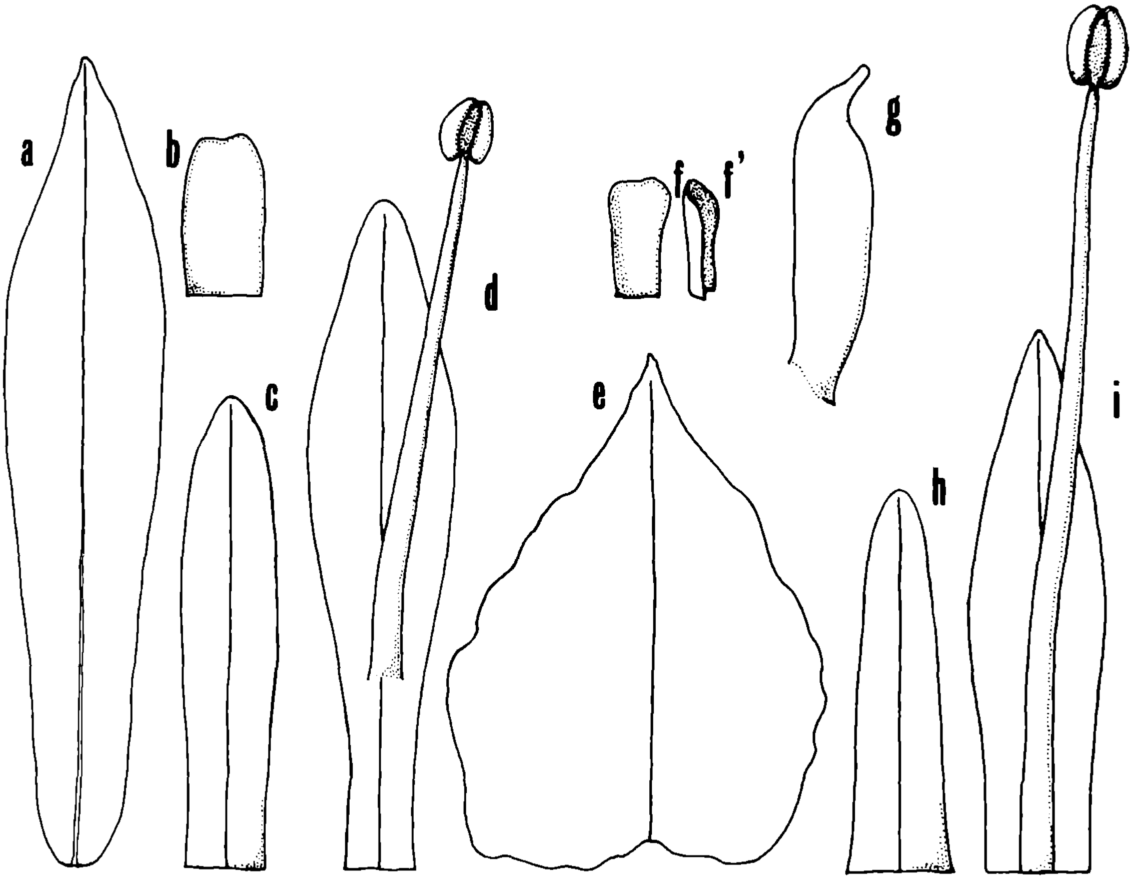

Fig. 40. *Sedum imbricatum* (Edgew.) Walpers (a–d). a. Leaf, × 3.75, b. Nectar-scale in dorsal view, ×15, c. Calyx-lobe, ×15, d. Petal with stamen, ×15. *Sedum heterodontum* Hook. f. et Thoms. (e–i). e. Leaf, ×3.75, f. Nectar-scale in dorsal and lateral (f′) views, ×15, g. Pistil in lateral view, ×7.5, h. Calyx-lobe, ×15, i. Petal with stamen, ×15. (a. Polunin, Sykes & Williams 2355, b. Polunin, Sykes & Williams 57, c & d. Edgeworth s.n., e, f, h & i. Stainton 4312, g. Thomson on 16 Jun., 1848).

dorsally, usually 0.8–1.1 mm long 0.4–0.6 mm wide 0.15 mm thick, probably reddish. Gynoecium of female plants usually 5–6 mm long (usually 2.5–3 times longer than the petal), connected 1–1.5 mm ventrally from the base, sessile, nearly erect, the ovary usually isomerous (4 or 5) but rarely anisomerous (3 or 6), ventrally straight but in the uppermost part more or less abruptly outcurved, convex dorsally, broadest above the middle, usually 1.2–1.4 mm wide, the style short, less than 0.6 mm long, oblique, the stigma rather distinct, minutely mamillate (the mamilla less than 0.05 mm long); the placenta nearly marginal. Gynoecium of male plants much smaller, usually 1.2–1.7 mm long, ovules mostly absent. Ovules of female plants 20–30 in each locule, descending, nearly narrowly oblong-elliptic, round at the apex, usually 0.6–0.7 mm long, the funicles about 0.2 mm long. Follicles 6–8 mm long, more or less conspicuously outcurved in the upper ventral side, brown. Seeds brown, nearly ellipsoidal, round at the apex, usually 1.2–1.5 mm long.

Distr. Kashmir, Kumaon, Nepal, and Tibet.

Specimens examined. Kashmir. alt. 6000–7000 ft. (Thomson s.n. ♂ on May 4, 1848, K (in Herb. Hook.)–Syntype of *Sedum heterodontum* Hook. f. et Thoms.); Kunawar, alt. 9000 ped. (Thomson s.n. ♀ on Aug. 16, 1847, K (in Herb. Hook.)–Syntype of *S. heterodontum* Hook. f. et Thoms.); Kishtwar, alt. 7000–8000 ped. (Thomson s.n. ♀ on Jun. 16, 1848, K (in Herb. Hook.)–Syntype of *S. heterodontum* Hook. f. et Thoms.); Chamba State, near Donai, alt. 10000 ft. (Lace 1626, CAL). Kumaon. Pindare, alt. 12700 ft. (Strachey & Winterbottom 11 ♂, K). Nepal. Phoksomdo Tal, 29°50′ N, 82°57′ E, alt. 13000 ft. On rocky slopes. Flowers yellow (Stainton 4312 ♂, BM, TI); Tingjegaon, alt. 16600 ft. Among boulders on river terrace. Stamens yellow; perianth green (Polunin, Sykes & Williams 1161, BM). Tibet. Gyangtse (Walton s.n. ♂, K, CAL).

This species is closely related to *Sedum roseum* (L.) Scopoli from Europe but slightly differs from the latter in having triangular or triangular-, pentagonal- or broadly pentagonal-ovate leaves scattered along tall stems.

Hooker f. and Thomson recorded '*S. Rhodiola* DC.' in the Himalayan region. The plant identified as *S. Rhodiola* seems to be different from *S. heterodontum* s. str. in having leaves with entire or nearly entire margin, but is not distinguishable from the latter because the margin of *S. heterodontum* seems to vary continuously from entire through repandous to coarsely teethed.

Sedum imbricatum (Edgeworth) Walpers, Ann. Bot. Syst. **1**: 325 (1848). [Fig. 40 a-d]

Rhodiola imbricata Edgeworth in Trans. Linn. Soc. London **20**: 47 (1846).

Sedum imbricatum Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 101 (1858).

Sedum Rhodiola DC. sensu C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 417 (1878), pro minore parte.

Sedum roseum (L.) Scop. sensu Fröd. in Act. Hort. Gothob. **5**: append. 37 (1930), pro minima parte.

Sedum crassipes Hook. f. et Thoms. sensu Kitamura in Kihara, Fauna Fl. Nepal Himal. 140 (1955).

A perennial herb, up to 30 cm high. Rhizomes very thick, subcylindrical to long-ovoidal, usually 2–2.5 cm across, accrescent, sparsely branched in well developed state, erect to ascending, the base tapering to the dauciformed root, the upper parts epigaeous, covered with scaly leaves and also often the remains of former year's dead stem. Scaly leaves blackish brown to chestnut-brown, chartaceous, glabrous, more or less persistent, appressed to each axillary flowering stem, triangular-ovate to very broadly ovate with entire margin, obtuse or round at the apex, 6–9 mm long 5–8 mm wide. Flowering stems annual, 3–5(–6) in number, erect, simple, robust, often somewhat reddish, glabrous, epapillate, nearly terete, 10–20 cm long and (3–)4–6 mm thick during the flowering time but after accrescent to 20–30 cm long (5–)6–9(–10) mm thick; the remains of former year's flowering stem mostly crumbled and stramineous. Leaves alternate, densely arranged throughout, imbricate in bud, sessile, shortly spurred (the spur usually 0.5–1 mm long), thick herbaceous or somewhat fleshy, flattish, glabrous, epapillate, usually 20–30 mm long 3–6(–7) mm wide, 4–6.5 times longer than broad, mostly very narrowly obovate (SADT n. 45) to narrowly elliptic (SADT n. 1–2) or rarely ovate (SADT n. 38), acute or deltoid in the apical part, acute at the apex, round or cuneate at the base, nearly entire to remotely denticulate along the margin of the upper half (the teeth 6–12 in number, oblique upwards, acute, with obtuse sinus), nearly entire in the lower half, the costa not prominent, the lateral veins 5–8 on each side of costa, spreading to arched. Inflorescences terminal, 1–1.5 cm long 2.5–3 cm wide, involucrate (i.e. surrounded by the upper cauline leaves and bracts), forming very dense and compact corymb-fascicles (usually 20–40-flowered, the cluster 6–14 in number) or a simple-corymb (usually consisting of 1–3-flowers), erect throughout the anthesis; peduncles very short or lacking, ca. 0–4 mm long, glabrous, nearly terete; bracts fewer in number, mostly narrowly elliptic but rarely very narrowly obovate, entire along the margin, usually deltoid-acute at the apex, round at the base, sessile, not or very slightly spured, flattish, glabrous, 7–10 mm long 2–3 mm wide; pedicels glabrous, 3–5 mm long, hardly elongate after flowering. Flowes in June to August, 4- or 5-merous, opening upwards, usually dioecious but rarely andro-dioecious, the alabastrum deep red. Calyx[1] 4.5–6.5 mm long, thick herbaceous, green and very often reddish, the tube 1.2–2 mm long (in length equalling the 1/3–1/4 of the lobes), tapering below, the lobes (2.9–)3–4(–4.3) mm long 0.8–1 mm wide, linear to subulate or linear-ovate, entire along the margin, round at the apex, suberect, flattish, valvate in bud, the sinus between lobes obtusely round. Petals distinct, valvate in bud, ascending or nearly erect in anthesis, very narrowly angular-obovate (SADT n. 63) or oblong-obovate, round at the apex, entire along the margin, 5–6.5 mm long 1.2–1.5 mm wide, glabrous, slightly round outside and concave inside, pale yellow but in dried materials usually dull yellow. Stamens distinctly longer than the petals, nearly erect to ascending at anthesis; filaments filiform but slightly tapering from the base, about 0.25 mm wide at the base, glabrous, reddish or rose pink, flattish, the epipetalous ones inserted 1.5–3 mm from the

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1) In the present study the female plant in flowering could not examine. Therefore, the description in the floral parts is based on the male and hermaphrodite plant only.

base, mostly 3.5–4.5 mm long, the alternipetalous ones 5.5–8 mm long; anthers basifixed, nearly ellipsoidal, usually round but rarely retuse at the apex, 0.5–0.7 mm long, before anthesis dark purplish red but after dehiscence turning deep yellow. Nectar-scales usually broadly oblong (SADT n. 17) or rarely oblong with round and often emarginate apex, nearly erect, concave ventrally and convex dorsally, strongly appressed to the ovary, usually 0.7–1.2 mm high 0.5–0.9 mm wide, about 0.15 mm thick, probably dark red. Gynoecium usually 3–5 mm long, erect to suberect, connected 0.5–1.2 mm ventrally from the base, the ovary straight ventrally, slightly convex dorsally, broadest near the middle, about 0.7 mm wide, not conspicuously outcurved in the uppermost part, the style indistinct, gradually tapering from the ovary-apex, less than 0.8 mm long, ending into an epapillate stigma, the placenta nearly marginal. Ovules 8–10 in each locule, ellipsoidal with round apex, about 0.6 mm long, often(?) abortive. Follicles brown, erect, not conspicuously outcurved in the apical part, 8–12 mm long. Seeds reddish brown, about 1.5 mm long, ellipsoidal with elongate apex.

Distr. Kumaon and Nepal.

Specimens examined. Kumaon. Liti, alt. 11000–12000 ped. (Edgeworth s.n. in 1844, K (in Herb. Bentham.)–Holotype of *Rhodiola imbricata* Edgew. and syntype of *Sedum imbricatum* Hook. f. et Thoms.). Nepal. Sringi Himal, Shiar Khola, alt. 17000 ft. Unconsolidated scree & boulder slopes (Gardner 651 & 652, BM); Kongyur La, alt. 18000 ft. Screes. Flowers yellow (Lowndes 1314, BM); Saldang-gaon, ca. 4 miles S. W., alt. ca. 18500 ft. On shady scree. Flowers pale yellow (Polunin, Sykes & Williams 5, BM); near Gangla Bhanjyang, alt. 15500 ft. On large broken rock masses. Flowers yellow, but calyx mainly reddish; growing a red appearance especially when in bud (Polunin, Sykes & Williams 2355, BM, TI); Dojan Khola, alt. ca. 18500 ft. Growing on scree slopes. Flowers yellow; anthers brownish purple (Polunin, Sykes & Williams 57, BM); Namdo, N. of Mustang, alt. 17000 ft. Amongst stones on open slope. Inflorescence dark red (Stainton, Sykes & Williams 2339, BM); near Dogadi Khola, alt. 15000 ft. Among boulders & screes. Flowers pale yellow (Stainton, Sykes & Williams 3193, BM, TI); Thinigaon, Muktinath Himal, alt. 15000 ft. On scree slopes. Flowers pale yellow (Stainton, Sykes & Williams 1288, BM); Thaple Himal, alt. 4800 m (Nakao s.n., KYO, TI, TNS).

Rhodiola (=*Sedum*) *imbricata* Edgew. was reduced to a synonym of *S. Rhodiola* DC. (=*S. roseum*) by Clarke (1878). However, the former species seems to be specifically distinguishable from the latter by leaves which are very narrowly obovate or narrowly elliptic with nearly entire margins, usually 20–30 × 3–7 mm in size and not glaucous against the latter's circular-ovate to narrowly oblong and glaucous leaves with usually dentate margins (usually 12–26 × 7–15 mm in size). *S. crenulatum* Hook. f. et Thoms. resembles *S. imbricatum* but differs from the latter in having typically or broadly elliptic petiolate leaves and purplish flowers. *S. heterodontum* differs from *S. imbricatum* in having triangular to triangular-, pentagonal-, or broadly pentagonal-ovate leaves, nearly ebracteate inflorescences and relatively narrow petals. *S. imbricatum* Hook. f. et Thoms. is a later homonym of *S. imbricatum* (Edgew.) Walpers and quite identical with the latter.

Sedum crenulatum Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 96 (1858)–

C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 417 (1878)-Hemsley in Journ. Linn. Soc. Bot. **35**: 177 (1902). [Plate 11; Fig. 41]

Sedum rotundatum Hemsley in Hooker's Icon. Pl. **25**: pl. 2469 (May, 1896); in Kew Bull. **1896**: 210 (Nov., 1896); in Journ. Linn. Soc. Bot. **35**: 178 (1902)-R.-Hamet in Not. Bot. Gard. Edinb. **8**: 141 (1913)-Praeger in Journ. Roy. Hort. Soc. **46**: 39, t. 11 (1921); in Not. Bot. Gard. Edinb. **13**: 94 (1921)-Limpricht in Fedde, Repert. Beih. **12**: 392 (1922)-Fröd. in Act. Hort. Gothob. **1**: 28 (1924), descript. pl. femin.; in Hand.-Mzt., Symb. Sin. **7**: 407 (1931)-Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18a**: 442 (1930).

Sedum roseum (L.) Scop. sensu Fröd. in Act. Hort. Gothob. **5**: append. 37 (1930), pro min. parte.

Sedum bupleuroides Wall. ex Hook. f. et Thoms. var. *rotundatum* (Hemsl.) Fröd. in Act. Hort. Gothob. **5**: append. 44 (1930).

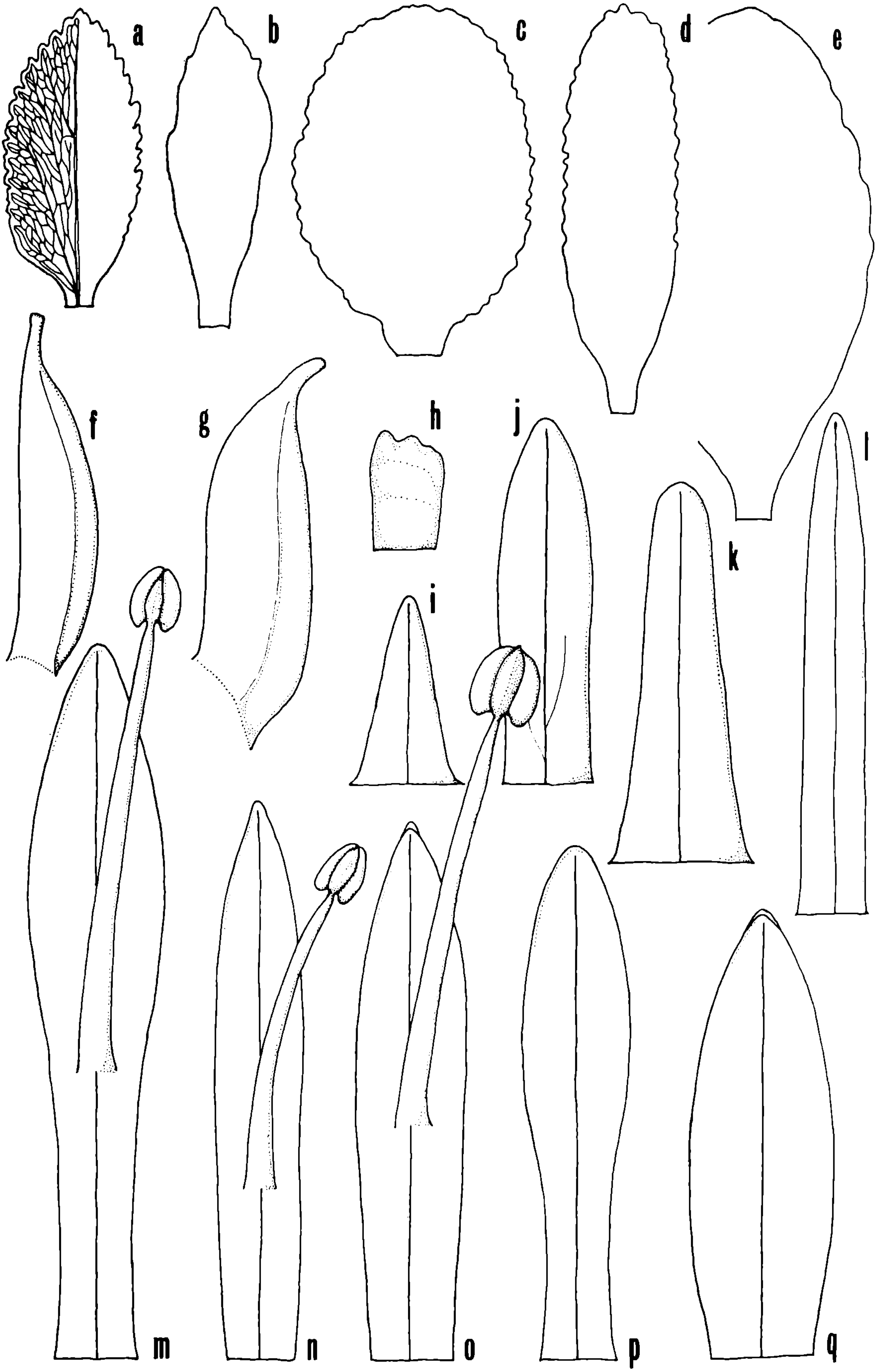
Sedum euryphyllum Fröd. in Hand.-Mzt., Symb. Sin. **7**: 406 (1931); in Act. Hort. Gothob. **10**: append. 157, t. 1262–1270 (1935).

Sedum megalanthum Fröd. in Journ. Wash. Acad. Sci. **25**: 124 (1935); in Act. Hort. Gothob. **10**: append. 158, t. 1271–1277 et pl. 109 (1935); in Ark. Bot. **30A** (9): 4 (1943).

Rhodiola rotundata (Hemsl.) Fu in Act. Phytotax. Sin. Addit. **1**: 122 (1965).

Rhodiola euryphylla (Fröd.) Fu in Act. Phytoax. Sin. Addit. **1**: 122 (1965).

A perennial herb up to 21 cm high. Rhizomes very thick, subcylindrical, usually 2–2.5 cm across, accrescent, sparsely branched in well developed state, more or less epigaeous, suberect to ascending, the base tapering to the dauciformed root, the upper parts clothed with the remains of the former year's old flowering stem and covered with scaley leaves. Scaly leaves ferruginous, thick membranaceous or chartaceous, glabrous, persistent, rigidulous later, very widely to widely triangular-ovate with entire margins, round to obtuse at the apex, appressed to each axillary flowering stem, 7–10 mm long 6–10 mm wide. Flowering stems annual, (3–)5–7(–10) in number, simple, usually fastigiate, 15–21 cm long 7–9 mm thick during the flowering time, robust, glabrous, nearly epapillate, terete, waxy yellowish green in the flowering but after turned ruddy brown, the lower parts remaining one year after death; the remains dark purplish brown, often shining. Leaves alternate, rather densely arranged, imbricate, more or less indistinctly petiolate; petioles very short usually 0.8–2 mm long and 1.7–2 mm wide, very strongly obcompressed, concave above, slightly spurred (about 0.5 mm long), glabrous; laminae more or less fleshy, flattish, glabrous, epapillate, typically to broadly elliptic (SADT n. 4–5), round at the apex, round or obtuse at the base, more or less abruptly narrowing into petiole, usually minutely crenulate to erose but rarely nearly entire along the margin (the teeth-apex round to nearly truncate, the sinus between the teeth round to obtuse), 10–33 mm long 5.5–17 mm wide, 1.3–2.2 times longer than broad, yellewish green but in dried specimens mostly ruddy brown, the costa not prominent, the lateral veins spreading. Inflorescences terminal, 20–40-flowered, dense and compact, bracteate, forming simple corymb-fascicles (the cluster mostly 2- or 3-flowered), surrounded by the upper cauline leaves and bracts, usually 1.5–2 × 1.5–2.5 cm in size; peduncles very short, glabrous, nearly terete, usually 0.5–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3 mm long; bracts 4–7 in number, typically or broadly elliptic to oblong or oblong-elliptic, sessile, entire to erose or minutely crenulate along the margin, attenuate to shortly attenuate at the base, 10–30 mm long 4.5–10 mm wide, flattish, glabrous, not or very slightly spurred; pedicels glabrous, usually 3–5 mm long in the flowering time but after elongate, 8–10 mm long. Flowers in June and July, dioecious, almost 5-merous, opening upward. Calyx 4–6(–9) mm long, thick herbaceous, green or (often?) dull red, the tube 1.4–2.4(–3) mm long (equalling about 1/2 of the lobes), tapering below, the lobes 2.6–4(–6) mm long 0.7–1.2 mm wide, nearly erect, valvate, flattish, linear to linear-elliptic or very narrowly ovate (SADT n. 36), entire along the margin, obtuse at the apex, the sinus between lobes obtuse to round, the veins not prominent. Petals distinct, valvate in bud, spreading to diffuse (♂) or nearly erect (♀) at anthesis, oblong-ovate or obovate to angularly obovate, round to obtuse at the apex, entire along the margin, 4.5–7 mm long 1.3–1.5 mm wide, glabrous, convex outside and concave inside, bright crimson or reddish purple or violet-blue when living but in dried material usually dull yellow. Stamens slightly longer than the petals, ascending or erect at anthesis; filaments nearly filiform but slightly tapering from the base, about 0.3 mm wide at the base, glabrous, pale reddish, somewhat fleshy, obcompressed, the oppositipetalous ones inserted 1.5–2 mm from the base and mostly 4–6.5 mm long, the alternipetalous ones distinctly shorter than another, usually 4–6 mm long; anthers basifixed, nearly ellipsoidal with round apex, 0.7–1 mm long, probably before anthesis purplish red and after dehiscence deep yellow. Nectar-scales oblong (SADT n. 16) to broadly oblong (SADT n. 17), ascending and very slightly outcurved, concave ventrally and convex dorsally, usually 0.8–1.2 mm high 0.8–0.9 mm wide about 0.15 mm thick, nearly truncate to rather emarginate at the apex, probably reddish. Gynoecium of female plants usually 7–10 mm long, erect to suberect, connected 1.5–2 mm ventrally from the base, dorsally adnate to the calyx-tube, the ovary nearly straight ventrally, somewhat obtusely keeled dorsally, opposite to the calyx-lobe and nectar-scale, 1.5–2 mm wide, widest between the middle and the base, the uppermost dorsal side more or less abruptly narrowing but hardly outcurved, the style indistinct, gradually tapering from the ovary, straight, about 2–3 mm long, ending into an epapillate stigma; the placenta nearly marginal. Gynoecium of male plants 4–6 mm long, usually shorter than the stamen. Ovules (6–)8–12 in each locule, ellipsoidal with elongate apex, about 0.8 mm (♀) or 0.4–0.6 mm (♂) long; those of male plants usually abortive (?). Follicles dirty red or brown, erect, 12–13 mm long. Seeds reddish brown, 2.0–2.3 mm long 0.8 mm thick, ellipsoidal with elongate apex, obtuse at the apex, the testa longitudinally minutely striate.

← Fig. 41. *Sedum crenulatum* Hook. f. et Thoms. a–e. Leaves, ×3.75, f & g. Pistils in lateral view, ×7.5, h. Nectar-scale in dorsal view, ×15, i–l. Calyx-lobes, ×15, m–o. Petals of male flowers with stamen, ×15, p & q. Petals of female flowers, ×15. (a. Mc Cosh 376, b, g–h, j & q. Hooker s.n., c. Kanai et al. 3238, d. Bowes-Lyon 3411, e, k & m. Forrest 12833, f & p. Forrest 6622, i & n. Littledale s.n., l & o. Hooker s.n.).

Distr. Nepal, Sikkim, Tibet, Bhutan, and Yunnan.

Specimens examined. Nepal. Rolwaling Khola, alt. 17800 ft. Scree (Bowes-Lyon 2196 ♂, BM; TI); Inukhu Khola, Naulekh Mathi, 27°30′ N, 86°45′ E, alt. 16000 ft. On morainne. Flowers violet blue; stamens reddish (Mc Cosh 376, BM; TI). Sikkim. Yeumtong, alt. 14000 ft. (Hooker s.n. on Sept. 6, 1849 ♂, K (in Herb. Hooker)–Lectotype of *Sedum crenulatum* Hook. f. et Thoms.); Donkiah, alt. 10000 ft. (Hooker s.n. on Sept. 9, 1849 ♀, K–Syntype of *Sedum crenulatum* Hook. f. et Thoms.). Tibet. Meenk La (King's collector s.n. ♀, CAL); Gooring Valley, 30°12′ N, 90°25′ E, alt. ca. 16500 ft. (Littledale s.n. in July–Aug. 1895 ♂, K–Holotype of *Sedum rotundatum* Hemsley); Niti Pass, alt. 16800 ft. (Strachey & Winterbottom 15, K–Syntype of *Sedum crenulatum* Hook. f. et Thoms.); Sarong, On Doker-la, Mekong-Salwin divide, 28° 20′ N, alt. 12000 ft. Open ledges of cliffs and humus covered boulders. Flowers bright red-crimson (Forrest 14707 ♂, E). Bhutan. Bomtang, Shur Chu, alt. 15400 ft. Among boulders facing south. Flowers red & showy (Bowes-Lyon 3411 ♂, BM); Lingshi–Yale la–Shodu, alt. 4500 m. (Kanai, Murata, Ohashi, Tanaka & Yamazaki 3238 ♂, TI); near Yale la, alt. 4650 m (Nishioka s.n. ♀, TI). Yunnan. Prope Likiang, monte Yülingshan (Handel-Mazzetti 3822 ♂, GB-Isotype of *Sedum euryphyllum* Fröd.); eastern flank of the Lickiang Range, 27°30′ N, alt. 13–14000 ft. Stony alpine pasture. Flowers deep rose (Forrest 6622 ♀, E); mountains of the Chungtien Plateau, 27°30′ N, alt. 13000 ft. Open ledges of cliffs and on stony pasture. Flowers crimson (Forrest 12833 ♂, E); Yung Ning; the summit, in grass flower bed (Mc Laren's collector 85 ♂, E).

This species closely related with *Sedum imbricatum* and also *S. heterodontum* but is distinguished from the latter two mainly in having shortly petiolate and typically or broadly elliptic leaves and crimson or purple or violet-blue flowers.

Fröderström (1930) considered that *Sedume rotundatum* Hemsley was conspecific with *S. bupleuroides*, and he treated the former as a variety of the latter. However the holotype specimen of *S. rotundatum* (Littledale s.n. ♂, K) seems to exceed the variation range of *S. bupleuroides* especially in petals, styles and inflorescences; i.e., the shape of male petals linear or linear-obovate against narrowly obovate or oblong-obovate or elliptic in *S. bupleuroides*; the size of the petal 5.5–7 × 0.8–1.5 mm against 2.8–4 × 1.2–1.6 mm; styles 0.3–0.8 mm long against less than 0.3 mm long; inflorescences a simple corymb-fascicles against a compound-corymb. As compared with the authentic specimens of *S. crenulatum*, the type specimen of *S. rotundatum* has extremely large leaves with nearly entire margin, but the size and serration of leaf of *S. crenulatum* as definited above show a considerable variation among the specimens examined. Therefore *S. rotundatum* may not be distinguishable specifically from *S. crenulatum.*

S. euryphyllum is quite similar to *S. crenulatum* as pointed out by Fröderstöm (1931) in the original description as "modo crescendi et inflorescentia congesta involucrata affine videtur *S. crenulato* . . . ". The isotype specimen of *S. euryphyllum* (Handel-Mazzetti 3822 ♂, GB) has broadly or typically elliptic leaves with nearly entire margin. The leaves is 18–24 × 14–15 mm in size. As regard the size of leaf, *S. euryphyllum* represents an intermediate state between *S. crenulatum* s. str. and

S. rotundatum. Judging from the photograph of the type, *S. megalanthum* seems to represent an intermediate state between *S. rotundatum* and *S. euryphyllum*. Therefore, the variation of its size is considered to be continuous. Then I consider these four species to be conspecific, as I could not find any reliable differences between them.

Sedum Wallichianum Hooker, Icon. Pl. **7**: t. 604 (1844)-Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 100 (1858)-Weibel in Candollea **16**: 145 (1958)-Hara, Fl. E. Himal. 107 (1966), pro parte. [Fig. 42 1–o]

Sedum crassipes Wall. [Cat. no. 7234 (1832), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 99 (1858)-Maxim. in Bull. Acad. Sci. St.-Pétersb. **29**: 127 (1883), in adnota-Diels in Engl., Bot. Jahrb. **29**: 360 (1901), versim.-Praeger in Journ. Roy. Hort. Soc. **46**: 55, fig. 20 (1921); in Not. Bot. Gard. Edinb. **13**: 77 (1921)-Fröd. in Act. Hort. Gothob. **5**: append. 35 (1930), excl. var. *Cretini* (R.-Hamet) Fröd. et *S. Stephani*; loc. cit. **15**: 11 (1942); in Hand.-Mzt., Symb. Sin. **7**: 407 (1931); in Bull. Fan Mem. Inst. Biol. Bot. **7**: 12 (1936)-Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18a**: 442 (1930)-Kitamura in Kihara, Fauna Fl. Nepal Himal. 140 (1955), excl. specim. cit.

Sedum asiaticum (D. Don) DC. sensu C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 419 (1878), cum var. *Wallichianum*-W. W. Smith in Rec. Bot. Surv. Ind. **4**: 259 (1911)-Limpricht in Fedde, Repert. Beih. **12**: 391 (1922), versim.-Rao in Rec. Bot. Surv. Ind. **18**: 29 (1961), versim.

Chamaerhodiola crassipes (Wall. ex Hook. f. et Thoms.) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 30 (1934).

Rhodiola crassipes (Wall. ex Hook. f. et Thoms.) A. Boriss. in Komarov, Fl. USSR **9**: 476 (1939), in obs.

Rhodiola Wallichiana (Hook.) Fu in Act. Phytotax. Sin. Addit. **1**: 125 (1965).

A perennial herb, up to 30 cm high. Rhizomes long elongate, nearly cylindrical, solid, usually 2–3 cm thick, up to 20 cm long, usually not or very scarcely branched except the basal part, eburneous, marked by elliptic scars of flowering stems, creeping except the ascending or suberect apical part, the apical part always epigaeous and crowned by scaly leaves, the base continuously tapering to the dauciformed root. Scaly leaves chartaceous, more or less persistent, rigidulous later, triangular to triangular-ovate or concaved-triangular, acute at the apex, nearly entire along the margin, ferrugineous in the beginning, chestnut- or blackish brown later, 3–8 mm long 2–6 mm wide. Flowering stems 5–12 in number, annual, simple, nearly terete, glabrous, usually nearly smooth but often papillate in the upper parts (the papilla about 0.1 mm long), usually fastigiate, 15–30 cm long 3–6 mm thick at anthesis, somewhat accrescent later, slightly yellowish green, the old flowering stem occaisionally remaining. Leaves alternate, rather densely arranged throughout, spreading widely, sessile, nearly spurless, thick herbaceous, usually linear to very narrowly ovate (SADT n. 36) or rarely very narrowly elliptic (SADT n. 1), usually 1.2–3 cm long 1.2–6 mm wide, nearly flattish above, somewhat round beneath, obtuse at the apex, long attenuate at the base, remotely and irregularly crenulate in the upper half but nearly entire in the lower half along the margin (the teeth 1–6 in number, convex in the basal side, straight in the apical side, round at the apex), bright or yellowish green above, slightly pale green beneath, glabrous, mostly epapillate, the costa shallowly depressed, the lateral veins usually 4–7 on each side of the costa, nearly parallel to diverging, scatteringly anastomosing. Inflorescences terminal, dense, nearly globosal to hemispherical, 2–3.5 cm across, bracteate, forming simple corymb-fascicles; the cluster usually 3–4 in number, (1–)2–3-flowered; peduncles and pedicels 1–4 mm

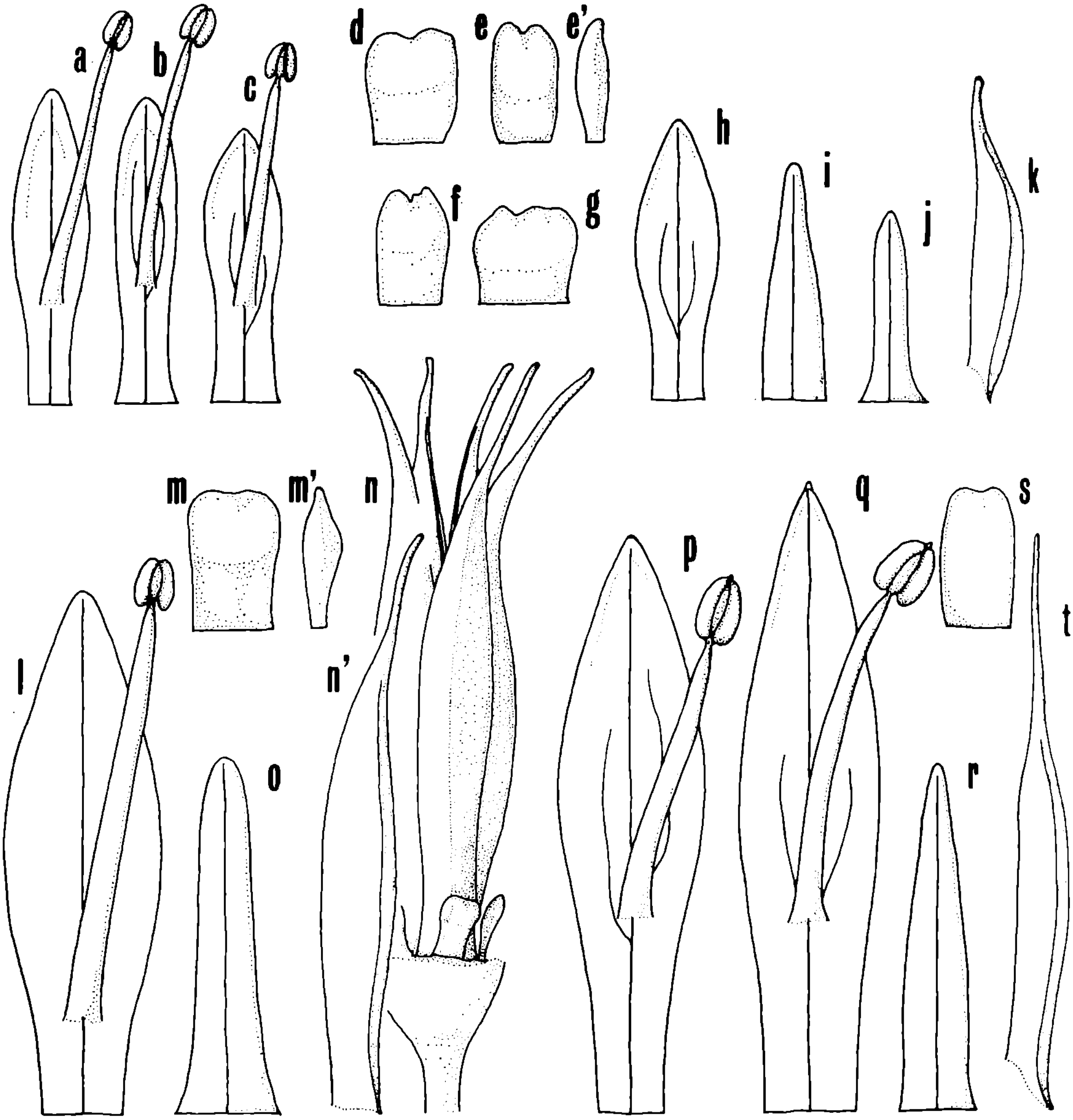

Fig. 42. *Sedum Cretinii* R.-Hamet (a–k). a–c. Petals with stamen, × 7.5, d–g. Nectar-scales in dorsal and lateral (e') views, × 15. h. Petal of female flower, × 7.5, i & j. Calyx-lobes, × 7.5, k. Pistil in lateral view, × 7.5. *Sedum Wallichianum* Hook. (l–o). l. Petal with stamen, × 7.5. m. Nectar-scale in dorsal and lateral (m') view, × 15, n. Pistils, × 7.5. o. Calyx-lobe, × 7.5. *Sedum nepalicum* H. Ohba (p–t). p & q. Petals with stamen, × 7.5. r. Calyx-lobe, × 7.5, s. Nectar-scale in dorsal view, × 15, t. Pistil in lateral view, × 7.5. (a–c Kanai et al. 726352, d–k. Kanai et al. 726348, l–o. Kanai, Hara & Ohba 726012, p, s & t. Stainton, Sykes & Williams 2222, q. Stainton, Sykes & Williams 2045).

long, nearly terete, usually densely or rarely moderately papillate (the papilla pellucid, mostly capitellate, about 0.1 mm across); bracts leafy, very similar to the upper cauline leaves in shape, usually 5–7 mm long 1–1.5 mm wide. Flowers in middle July to early September, hermaphrodite, mostly 5-merous but sometimes 4- or 6-merous, 1–1.2 cm across at anthesis, the alabastrum oblong, obtusely pointed, pale greenish white or pinkish. Calyx 6–8.5 mm long, green, glabrous, the tube usually less than 1 mm long, the base rather continuously tapering to the pedicel, the lobes 5.6–8 mm long 1.3–1.7 mm wide (equalling about the 3/4 of the petal in length), narrowly triangular (SADT n. 73) or subulate, nearly entire along the margin, round and often reddish at the apex, somewhat round outside, flattish inside, not spreading and rather appressed to the petals alternately. Petals distinct, distinctly imbricated or quincunx in bud, usually pale greenish or yellowish white or often pinkish, somewhat fleshy, glabrous, ascendings or slightly spreading at anthesis, usually narrowly elliptic or often linear, round at the apex, shallowly boat-shaped, entire along the margin, 7–11 mm long 1.8–2.5 mm wide. Stamens slightly shorter or longer than the petal, ascending at anthesis; filaments linear-filiform, obcompressed, somewhat fleshy, glabrous, white or pinkish, about 0.4 mm wide at the base, the epipetalous ones inserted about 1.5 mm from the base, and 7–8 mm long, the alternipetalous ones 7.5–12 mm long; anthers basifixed, ellipsoidal or ovoidal, usually 0.4–0.6 mm long, round or slightly retuse at the apex, before anthesis dark purplish red, after dehiscence turning yellow. Nectar-scales oblong, very shallowly retuse at the apex, slightly concaved inside, flattish outside, 1–1.2 mm long 0.6–0.7 mm wide about 0.3 mm thick, pale yellow to orange yellow. Gynoecium 9–14 mm long, usually slightly longer than the petal, very shortly connate (ca. 0.5 mm) ventrally at the base, erect, pale greenish white, the ovary 6.5–10 mm long 1.2–2 mm wide, nearly straight ventrally, gradually tapering to both ends from the middle in dorsal side, the style often outcurved slightly, mostly 2.5–4 mm long, the stigma very slightly swelling, epapillate; the placenta nearly marginal. Ovules 28–36 in each locule, mostly descending, ellipsoidal, somewhat elongate and round at the apex, 0.4–0.6 mm long, the funicles 0.2 mm long.

Distr. Kashmir, Nepal, Sikkim, and Tibet.

Specimens examined. Kashmir. Lowari Pass, alt. 11000 ft. (Harriss 16155, CAL). Nepal. (Scully 231, CAL); Thakurji Lekh, near Jumla, alt. 12000 ft. Growing between boulders by stream. Sepals & petals pale yellow; filaments pale yellow; anthers dark green; ovaries pale yellow with orange glands (Polunin, Sykes & Williams 4718, BM); Annapurna Himal, Seti Khola, alt. 12000 ft. Among boulders. Petals pale green. Anthers orange (Stainton, Sykes & Williams 6673, BM; TI); Lete, S. of Tukucha, Kali Gandaki,alt. 11000 ft. On rocky slopes amongst shrubs (Stainton, Sykes & Williams 7911, BM); Khola Kharka, alt. ca. 13500 ft. Banks. Flowers yellow (Polunin 1074, BM); Bimtakothi, alt. 12500 ft. Moss-covered rocks on old moraine. Flowers greenish white tinged pink; stamens brown pink. Leaves yellow green (Lowndes 1440, BM); Singum Gompa–Gosainkund, alt. 3300 m. On mossy rocks (Kanai, Hara & Ohba 726012, TI); Gosainthan (Wallich 7234, BM, CAL–Type collection of *Sedum crassipes* Hook. f. et Thoms.); Brangechen

Kharka, alt. 13500 ft. Rocky ground. Petals pale green; ovaries red when ripe (Polunin 1711, BM); East of Chalike Pakar, alt. 13000 ft. Among boulders on river bed. Flowers greenish; anthers fawn (Stainton, Sykes & Williams 3740, BM); Maharigam, alt. 14000 ft. Among boulders and on grassy slopes. Flowers pale yellow; anthers yellowish-brown (Polunin, Sykes & Williams 209, BM); above Tankia, alt. 14000 ft. Between boulders beside river. Petals, filaments & ovaries pale yellow; anthers brown (Polunin, Sykes & Williams 3012, BM); Topke Gola, alt. 3600 m. On rocks by stream (Kanai, Ohashi, Iwatsuki, Ohba & Shakya 726010, TI); Beding, sables de Rohraling Khola, alt. 3600 m. Fleurs jaunes (Zimmermann 1423, BM); loc. cit. alt. 12–13000 ft. Flowers greenish yellow (Dhwoj 277, BM); Sangmo, alt. 12–18000 ft. (Dhwoj 293, BM); Lamrak, alt. 10–14000 ft. (Dhwoj 176, BM); Tang Boche, Khumbu, alt. 13000 ft. On wet rocks (Horsfall 23, BM); Thamu–Thami valley, Khumbu, alt. ca. 12500 ft. In moss on wet rocks near river (Horsfall 58, BM); Bagmati zone, Rasuwa District, Changbu, above Khangyin, alt. 3750 m. On rocks. Inflorescence reddish (Nicolson 2582, BM). Sikkim. (King's collector s.n., CAL); regio. alp. alt. 12–16000 ped. (Hooker s.n., CAL–Type collection of *S. crassipes* Hook. f. et Thoms.); Rishenang, alt. 13000 ft. (Ribu & Rhomoo 4506, CAL); Zemu (Smith & Cave 1621, CAL); Llonakh (Smith & Cave 2726, CAL). Tibet. Toong Lung (King's collector 4651, CAL).

Sedum Wallichianum is easily distinguishable from its allies in having relativly large (12–30 × 1.2–6 mm in size) linear or very narrowly ovate or very narrowly elliptic leaves and large white hermaphrodite flowers.

Sedum Cretinii R.-Hamet in Journ. Bot. **54**: suppl. 1, 16 (1916), ut '*Cretini*'-Praeger in Not. Bot. Gard. Edinb. **13**: 77, t. 171, 2 (1921) -Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930). [Fig. 42 a-k]

Sedum crassipes Wall. ex Hook. f. et Thoms. var. *Cretinii* (R.-Hamet) Fröd. in Act. Hort. Gothob. **5**: append. 36 (1930).

Chamaerhodiola Cretinii (R.-Hamet) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 30 (1934).

Sedum Wallichianum var. *Cretinii* (R.-Hamet) Hara, Fl. E. Himal. 108 (1966).

A perennial herb, up to 12 cm high. Roots fibrous, scattering. Rhizomes slender, surculose, always creeping except the apical parts, usually 2–4 mm thick, slightly pale yellowish brown, the apical part epigaeous nearly erect, crowned by scaly leaves. Scaly leaves membranaceous, caducous, triangular-ovate or semiorbicular, obtuse or round at the apex, entire along the margin, usually chestnut-brown, 2–3 mm long 1.5–2 mm wide. Flowering stems (1–)2–3(–5) in number, annual, more or less ascending or nearly erect, usually 6–12 cm long, 0.7–1.1 mm thick, simple, terete, glabrous but under a lens (× ca. 40) densely or moderately mamillate (the mamilla pellucid, usually less than 0.2 mm long), green, the dead flowering stem not persistent. Leaves alternate, rather densely arranged, spreading widely, sessile, mostly shortly spured (the spur about 0.5 mm long, with obtuse apex) or rarely nearly spurless, flattish, usually linear or very narrowly elliptic (SADT n. 1) or linear-obovate, entire or very minutely crenulate along the margin (the teeth 3–5 in number), acute or obtuse at the apex, long attenuate at the base, (6–)7–10 (–14) mm long 1.5–2.5(–2.8) mm wide, bright or yellowish green, glabrous, epapillate, sometimes reddish in the apical part, the costa very shallowly depressed, the lateral-veins not prominent, usually 3–5 on each side of the costa, nearly parallel to diverging. Inflorescences terminal, usually 3–20-flowered, bracteate, forming simple corymb-fascicles, up to 2 cm long and 3 cm wide; the cluster usually 3–7 in number, with 3 or 2 flowers; peduncles and pedicels mostly 1–5 mm long at anthesis, elongate afterwards, 5–10 mm long at fruiting, glabrous, nearly smooth or very sparsely mamillate (the mamilla about 0.1 mm long), terete; bracts leafy, very similar to the upper cauline leaves. Flowers in middle June to August, dioecious, usually 5-, often 4-, rarely 6-merous, usually 6–9 mm wide at anthesis, the alabastrum usually slightly greenish white or rarely reddish. Calyx 3.5–5.5 mm long, green, glabrous, the tube usually 0.6–1.2 mm long, the lobes 2.8–4.5 mm long (equalling 3/5–4/5 of the petal), 0.4–1.1 mm wide, usually slightly larger in the female, subulate or linear, entire along the margin, round or obtuse at the apex, shallowly boat-shaped or flattish. Petals distinct, slightly greenish or yellowish white, but often reddish near the apex, sessile, somewhat fleshy, glabrous, ascending at anthesis, usually very narrowly elliptic (SADT n. 1) or linear-obovate or very narrowly angular-elliptic, obtuse at the apex, widest at the middle, flattish in the lower part, shallowly boat-shaped in the upper part, entire along the margin, 3.5–6 mm long 0.9–1.5 mm wide. Stamens slightly (about 1.1 times) longer than the petal, ascending or nearly erect at anthesis; filaments linear-filiform, flattish, somewhat fleshy, glabrous, white or often reddish, about 0.4 mm wide at the base, the epipetalous ones inserted about 1.5 mm from the base, usually 4–6 mm long, the alternipetalous ones 5–7 mm long; anthers basifixed, ellipsoidal or globose, 0.5–0.6 mm long, usually slightly retuse at the apex, before anthesis dark purplish red, after dehiscence turning dull yellow. Nectar-scales broadly oblong (SADT n. 17), shallowly retuse at the apex, concave inside, convex outside, 0.6–0.9 mm long 0.5–0.8 mm wide about 0.2 mm thick, pale yellow to yellowish orange. Gynoecium 5–7 mm long, slightly longer in female plants, usually abortive in male plants, usually shortly connate (0.5–1 mm) ventrally at the base, sessile, erect, usually greenish white or often slightly reddish, the ovary 4–5.5 mm long 0.7–1.2 mm wide, nearly straight ventrally, gradually tapering upwards from the middle in dorsal side, the style often slightly incurved, mostly 1.3–1.5 mm long, the stigma slightly swelling, minutely mamillate; the placenta nearly marginal. Ovules 14–24 in each locule, descending, ellipsoidal, round at the apex, about 0.6 mm long, the funicles about 0.2 mm long. Follicles usually 7–10 mm long, nearly erect, rosy- or pale chestnut-brown. Seeds usually 1.6–1.9 mm × 0.5–0.7 mm in size, the testa more or less thick, glabrous, chestnut-brown.

Distr. Nepal, Sikkim, Tibet, and Bhutan.

Specimens examined. Nepal. Irukhu Khola, Dadh Kosi, alt. 14000 ft. Flowers greenish red (Bowes-Lyon 2077, BM); Arun Valley, Barun Khola, N. of Num, alt. 12500 ft. On rock-ledges. Flowers yellow (Stainton 674, BM, TI); Banduke Pokhari–Saju Pokhari, alt. 4000–4200 m. Among rock crevices by stream. Flowers cream (Kanai, Ohashi, Iwatsuki, Ohba & Shakya 720521, TI); Topke Gola–Jalang Chhyongo, alt. 4300 m. By streams. Petals milky white, often with reddish apex, anthers before anthesis purplish-red (K.O.I.O. & S. 726353, TI); Lama Chungbu-Samdan, alt. 4300 m. By streams. Flowers creamy white (K.O.I.O. & S. 726348, TI); Kipudonsu, alt. 3850 m. By streams. Flowers creamy white or pale reddish white (K.O.I.O. & S. 726352, TI). Sikkim. Jongri–Olothang, alt. 4000–4200 m. On mossy tree trunk by stream (Hara, Kanai, Murata, Togashi & Tuyama 6676 & 6675, TI). Bhutan. Laya, upper Wo chu, alt. 14000 ft. In dry gravelly ravines (Ludlow, Sherriff & Hicks 16466, BM); Guicha La, alt. 15000 ft. (Ribu & Rhomoo 6633, E); Gucha La, alt. 16000 ft. (Rohmoo Lepcha 1007, E).

Having surculose rhizomes, *Sedum Cretinii* is very characteristic among the Himalayan Rhodiola. By the character this species is easily recognizable among other species. *S. Cretinii* is considerably related with *S. Wallichianum* Hook., but apparently differs from the latter in this character and also in having dioecious flowers, deciduous scaly leaves, shorter and narrower leaves, small calyx, small petals, etc. *S. linearifolium* is also similar to *S. Cretinii*, but is distinguished from the latter in having hermaphrodite flowers, pauciflorous inflorescences, and broader petals. *S. fastigiatum* is somewhat similar to *S. Cretinii*, but is clearly distinguishable from the latter in having densely tufted remains of the old flowering stems, more or less massive rhizomes and relatively broad leaves.

In E. Nepal, *S. Cretinii* occurs in altitudes from 3850 m to 4300 m and grows in such habitats as scree, windswept, ridges, gravelly ravines, etc. The male and female plants are usually found together in each isolated colony.

Sedum nepalicum H. Ohba in Journ. Jap. Bot. **49**: 322, fig. 1, a–f (1974). [Plate 10b; Fig. 42p–t]

A perennial herb, usually 10–30 cm high. Rhizomes very thick, subcylindrical, 6–10 mm in diameter, more or less epigaeous, erect to ascending, the base tapering to the long creeping dauciformed root (up to 20 cm long), the upper part accrescent and well branched. Rhizomatoclades 1–7 in number, usually epigaeous, fleshy, subcylindrical, solid, erect to ascending, 10–25 mm long, 3–8 mm thick, rather densely covered with scaly leaves. Scaly leaves chartaceous, more or less persistent, triangular to broadly triangular or broadly trullate (SADT n. 59), 5–10 mm long 3–8 mm wide, acuminate or acute to obtuse at the apex, entire along the margin, deep brown to chestnut-brown. Flowering stems 3–5 from each rhizomatoclade, annual, not persistent when dead, usually 10–30 cm long, erect, simple, nearly terete, glabrous, under a lens (× ca. 10) always densely or moderately papillate (the papillae pellucid, 0.2–0.3 mm long), greenish, the scars of fallen leaves slightly arisen in dried materials. Leaves alternate, spreading, somewhat remotely arranged (the internodes distinctly shorter than the leaf-length), nearly sessile, almost spurless, thick herbaceous, flattish, glabrous but under a lens (× ca. 10) sparsely papillate on both surfaces (the papillae pellucid, less than 0.3 mm long), narrowly elliptic or narrowly ovate, 10–45 mm long 6–15 mm wide, 1.5–3.5 times longer than broad, usually round or rarely acute obtusely at the apex, long cuneate to cuneate-attenuate to attenuate at the base, 5- or 7-lobulate or remotely crenate-serrate, under a lens (× ca. 40) sparsely papillate along the margin, the teeth triangular to broadly triangular with acute or obtuse apex, the sinus between teeth angulate (the angle 60°–100°), the costa not prominent, the lateral veins 5–7 on each side of the costa, diverging. Inflorescences terminal, 6–12(–15)-flowered, bracteate, forming a simple corymb or a loosely compound corymb, the cluster 3–4 with mostly 3 but occaisionally 2 or very rarely single flower; peduncles 5–10(–25) mm long, nearly terete, usually very densely or rarely moderately papillate (the papillae 0.2–0.3 mm long); bracts sessile, the larger ones similar to the upper cauline leaves in shape and size, but smaller ones very narrowly ovate or very narrowly obovate with obtuse apex, nearly entire along the margin, 3–8 mm long 0.7–2 mm wide; pedicels 1–4(–6.5) mm long, nearly terete, mostly very densely or rarely moderately papillate. Flowers in August and September, hermaphrodite, mostly 5-merous, 7–10 mm wide at anthesis. Calyx 5–7 mm long, thick herbaceous, green, glabrous, the tube 1/5–1/7 as long as the lobes, tapering below, hardly papillate; the lobes linear to linear- or very narrowly ovate-triangular with entire margin, round or obtuse at the apex, 4–5.5 mm long 1–1.5 mm wide, nearly flattish, under a lens (×ca. 40) sparsely papillate or epapillate, the papilla less than 0.1 mm long. Petals white, distinct, rather thin, glabrous, nearly erect or ascending at anthesis, narrowly elliptic or very narrowly obovate (SADT n. 45) with very shortly mucronulate-obtuse apex, entire but under a lens (×ca. 40) very minutely undulate along the margin, round outside and concave inside, 8.5–10(–15) mm long 2–2.3(–3) mm wide, 4(–5) times longer than breadth. Stamens usually as long as the petals or rarely slightly shorter than those, ascending at anthesis; filaments subulate, fleshy, flattish, glabrous, white, about 0.5 mm wide at the base, the epipetalous ones inserted mostly about 3 mm from the base, 4.5–5.5(–10) mm long, the alternipetalous ones 7.5–9(–13) mm long; anthers basifixed, narrowly ellipsoidal with very minute projection at the apex, 0.8–1.2 mm long, before anthesis probably dark purplish red, after dehiscence turning yellowish. Nectar-scales oblong with entire margin, slightly to moderately emarginate or truncate at the apex, flattish, probably yellow when living but pale yellowish in dried materials, 0.9–1.2 mm long 0.6–0.7 mm wide about 0.2 mm thick. Gynoecium 12–16(–18) mm long, connected about 1 mm ventrally from the base, sessile, erect, white; the ovary 8.5–10(–13) mm long, straight or very slightly incurved ventrally, dorsally more or less round and tapering upwards from the middle, broadest near the middle 1.2–1.5 mm wide; the style usually 3.5(–5) mm long, more or less oblique, ending into an epapillate stigma; placenta nearly marginal. Ovules 14–24 in each locule, descending, ellipsoidal with round apex, usually 0.5 mm long.

Distr. W. and C. Nepal.

Specimens examined. Nepal. Dolpo, Lcharka, 29°00′ N, 83°26′ E, alt. 14500 ft. On riverside gravel. Flowers white (Stainton 5566, BM); Samargaon, N. of Tukucha, Kali Gandaki, alt. 13000 ft. Dry open hillside. Petals & filaments white, anthers red (Stainton, Sykes & Williams 7243, BM, TI); loc. cit. On rocks. Leaves pinkish yellow (Stainton, Sykes & Williams 8095, BM); Tegar, N. of Mustang, alt. 15000 ft. On rock ledges. Petals and filaments white, anthers brown (Stainton, Sykes & Williams 2222, BM–Holotype of *Sedum nepalicum* H. Ohba, TI–Isotype); Muktinath, alt. 12500 ft. On rock beneath, shade of trees. Petals and filaments white; anthers red; calyx green (Stainton, Sykes & Williams 2045, BM, TI).

This species is closely related with *Sedum Stephanii* Chamisso from the Transbaicalian region, but differs from the latter in having papillate stems, larger and papillate leaves, and white flowers. From *S. ovatisepalum* and *S. sacrum*, *S. nepalicum* is clearly distinguishable in having narrowly elliptic or narrowly ovate leaves, elliptic or very narrowly obovate petals and relatively large gynoecia.

Sedum bupleuroides Wall. [Cat. no. 7229 (1832), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 98 (1858)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 418 (1878)–W. W. Smith et Cave in Rec. Bot. Surv. Ind. **4**: 197 (1911)–W. W. Smith in Rec. Bot. Sur. Ind. **4**: 259 (1911) et 371 (1913)–R.-Hamet in Not. Bot. Gard. Edinb. **5**: 120 (1912); **7**: 131 (1912); **8**: 140 (1913)–Praeger in Journ. Roy. Hort. Soc. **46**: 46, fig. 16 (1921)–Limpricht in Fedde, Repert. Beih. **12**: 391 (1922)–Fröd. in Act. Hort. Gothob. **1**: 29 (1924); **5**: append. 43 (1930), cum var., sed excl. var. *discolor* (Franch.) Fröd. et var. *rotundatum* (Hemsl.) Fröd.; **15**: 11 (1942); in Hand.-Mzt., Symb. Sin. **7**: 407 (1931); in Bull. Fan Mem. Inst. Biol. Bot. **7**: 12 (1936); in Ark. Bot. **30** A (9): 5 (1943), cum var. *parvum* Fröd.–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 140 (1955)–Weibel in Candollea **16**: 143 (1958)–Hara, Fl. E. Himal. **2**: 41 (1971). [Plate 3c; Figs. 43, 44]

Sedum elongatum Wall. [Cat. no. 7233 (1832), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 98 (1858)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 419 (1878)–W. W. Smith et Cave in Rec. Bot. Surv. Ind. **4**: 197 (1911)–W. W. Smith in Rec. Bot. Surv. Ind. **4**: 259 (1911) et 371 (1913)–Praeger in Journ. Roy. Hort. Soc. **46**: 41, fig. 12 (1921)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 440 (1930)–Hara, Fl. E. Himal. **2**: 41 (1971); non Ledeb. (1843).

Sedum Cooperi Praeger in Journ. Bot. **57**: 49 (1919), non Clemenc. (1868).

Sedum discolor Franch. sensu Praeger in Not. Bot. Gard. Edinb. **13**: 78 (1921), pro parte, incl. specim. 'Forrest 2441 et 5690' cit., sed excl. specim. 'Cooper 26 et 128' cit. quae vere *S. discolor* Franch.–Fröd. in Act. Hort. Gothob. **1**: 29 (1924), versim.

Sedum bhutanense Praeger in Journ. Roy. Hort. Soc. **46**: 43, fig. 13, 14 (June 6, 1921)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 440 (1930).

Sedum bhutanicum Praeger in Not. Bot. Gard. Edinb. **13**: 73 (Aug. 1921).

Rhodiola bupleuroides (Wall. ex Hook. f. et Thoms.) Fu in Act. Phytotax. Sin. Addit. **1**: 124 (1965).

Rhodiola Hookeri Fu in Act. Phytotax. Sin. Addit. **1**: 124 (1965).

Rhodiola bhutanica (Praeger) Fu in Act. Phytotax. Sin. Addit. **1**: 125 (1965).

Sedum Thomsonianum H. Ohba in Journ. Jap. Bot. **48**: 331 (1973).

A perennial herb, very variable in size, usually 5 to 100 cm high. Rhizome thick, elongate or stout, usually massive or nearly obconical, solid, sparsely branched in well developed state, usually 1–3 cm across, up to 10 cm long, usually chestnut- or dark brown, the apical part more or less epigaeous, densely scaly. Scaly leaves chartaceous, ascending or erect, persistent, usually triangular or often oblong-ovate, acuminate to obtuse at the apex, entire along the margin, 1.5–8 mm long 0.5–6 mm wide, ferrugineous in the beginning, chestnut- or blackish-brown later. Flowering stems usually 1–2, but rarely (in a dwarf form) 5–10 in number, annual, usually erect or rarely ascending, nearly terete, glabrous, usually epapillate but often papillate throughout or in the upper part (the papilla usually 0.1–0.2 mm long), usually 5–100 cm long 1–5 mm thick, caducous. Leaves alternate, spreading widely, sessile to shortly petiolate (the petiole less than 10 mm long), spurless, thick herbaceous, flat, very variable in shape and size, usually narrowly, normally or broadly elliptic (SADT n. 2–5), nearly circular or narrowly, normally or broadly ovate (SADT n. 37–40) or obovate (SADT n. 46–49) or oblong-ovate, mostly 0.3–9.5 cm long 0.4–4.5 cm wide, round or obtuse in apical part, acute to very shortly cuspidate or obtuse to round at the apex, cordate or shortly attenuate or long attenuate at the base, entire to somewhat remotely and irregularly serrate along the margin (the teeth 4–8 in number on each side, nearly straight or convex in the apical side, convex in the basal side, round or obtuse at the apex, 0.5–2 mm long, the sinus between the teeth truncate or round), glabrous, mostly emamillate or rarely minutely mamillate on both surfaces and the margin (the mamilla less than 0.05 mm long), the costa not prominent above and usually slightly raised beneath, the lateral veins obscure, usually 4–8 on each side of costa, diverging. Inflorescences terminal, forming a peculiar corymb, usually 7–100-flowered, bracteate, the primary inflorescence-axes 1–4; peduncles 0.2–3 cm long, epapillate or densely papillate (the papilla 0.2 mm long); pedicels 0.2–1.5 cm long, epapillate or densely papillate; bracts similar to the cauline leaves in shape but smaller, 0.3–5 cm long 0.2–1.8 cm wide, mostly epapillate. Flowers dioecious, late June to August, mostly 5-merous, 4–7 mm across at anthesis. Calyx 1.6–8 mm long, glabrous, purplish red or dull purplish red, the tube 0.8–2.2 mm long, more or less funnel- or saucer-shaped, the lobes 0.8–6 mm long 0.3–1.2 mm wide, 1/2–3/4 (♂) or more or less equalling (♀) the petal in length, narrowly oblong or oblong-ovate or narrowly triangular, entire along the margin, round or obtuse at the apex, erect (♀) or ascending (♂) at anthesis, somewhat round outside, rather flattish inside, the sinus between lobes round or obtuse. Petals distinct, dark purplish-red, in male usually obovate to narrowly obovate or rarely ovate, in female narrowly oblong to oblong or narrowly oblong-ovate, usually 2.8–4 mm long and 1.2–1.6 mm wide (♂), 1.5–3 mm long and 0.5–0.7 mm wide (♀), nearly entire along the margin, round at the apical part, truncate to round and often very shortly mucronulate (♂) or round (♀) at the apex, glabrous, spreading very widely to somewhat reflexed (♂) or ascending to spreading (♀) at anthesis, in the upper 2/3 part shallowly boat-shaped. Stamens usually as long as the petal, ascending or erect at anthesis; filaments subulate, obcompressed, glabrous, usually purplish red, about 0.4 mm wide at the base, the epipetalous ones inserted about 0.5 mm from the base, 2–3.5 mm long, the alternipetalous ones 3–4 mm long; anthers basifixed, ovoidal, round or slightly retuse at the apex, usually 0.5–0.7 mm long, before anthesis dark- or dull-purplish red, after dehiscence turning yellow. Nectar-scales narrowly oblong to oblong (SADT n. 14–15) or rarely broadly oblong (SADT n. 17), round at the apical part, usually shallowly retuse at the apex, usually flattish but often in the upper 1/3 part recurved, shining, dark purplish- or blackish-red, 0.6–1.2 mm long 0.3–0.7 mm wide 0.2 mm thick. Gynoecium of female plants usually 3.5–9 mm long (mostly 3–5 times as

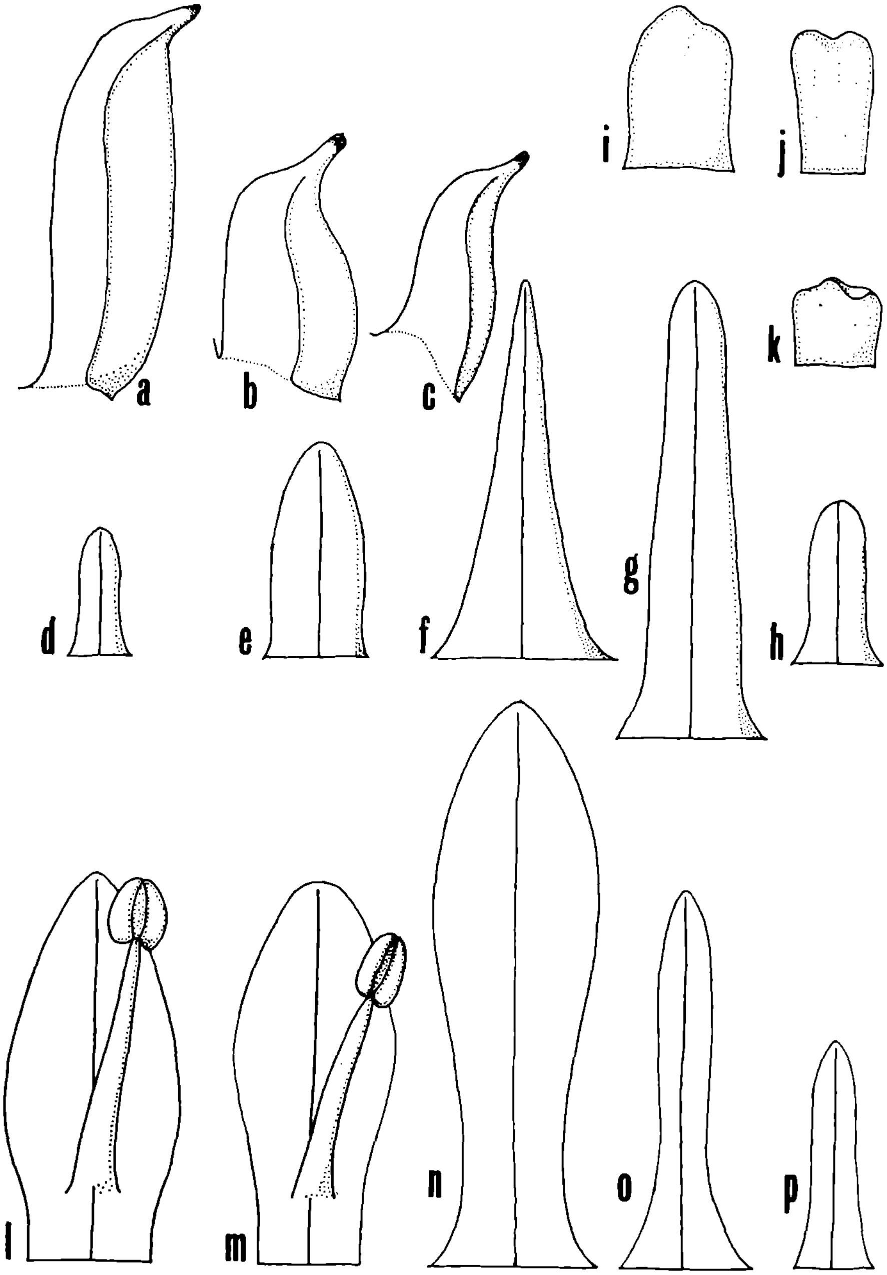

Fig. 43. *Sedum bupleuroides* Wall. ex Hook. f. et Thoms. a–c. Pistils in lateral view, ×7.5, d–k. Calyx-lobes, ×15, i–k. Nectar-scales in dorsal view, ×15, l & m. Petals of male flowers with stamen, ×15, n–p. Petals of female flowers, ×15. (a,f,j & n. Kanai et al. 726029, b, g, i & o. Kanai et al. 726018, c, h & p. Kanai & Shakya 672011, d, k & l. Kanai et al. 672011, e & m. Ludlow, Sherriff & Hicks 16620).

long as the petal), connected 1.2–1.7 mm ventrally from the base, sessile, nearly erect to ascending, usually pale green but often tinged red, dorsally adnate to the calyx-tube; the ovary opposite to the calyx-lobe and nectar-scale, 1–2 mm wide, usually widest near the base, the uppermost part abruptly narrowing and conspicuously outcurved; the style very short, less than 0.3 mm long, usually dark purple red; the stigma rather distinct, mostly epapillate but rarely minutely papillate (the papilla 0.05 mm long); the placenta nearly marginal. Gynoecium of male plants much smaller, usually 0.8–2 mm long, always shorter than the petals and stamens, similar to the female one in shape, ovules mostly absent. Ovules of female plants 10–16 in each locule, descending, nearly ellipsoidal, 0.7–0.8 mm long, round at the apex, the funicles about 0.2 mm long. Follicles 5–12 mm long, usually ascending or rarely suberect in the upper part, brown. Seeds reddish brown, nearly tubular, round at the apex, usually 1.8–2.5 mm long.

Distr. Nepal, Sikkim, Tibet, Bhutan, Yunnan, and N. W. Burma.

Specimens examined. Nepal. Gosain Than (=Gosainkund) (Wallich 7229, K, BM, CAL–Type collection of *Sedum bupleuroides* Wall. ex Hook. f. et Thoms.); Gosainthan (=Gosainkund) (Wallich 7233A, K, BM, CAL–Type collection of *Sedum elongatum* Wall. ex Hook. f. et Thoms.); Gosainkund, alt. 4000 m (Kanai, Hara & Ohba 726363, TI); Gosainkund–Surjakund, alt. 4350 m (Kanai, Hara & Ohba 726364, TI); Surjakund–Gopte, alt. 3650 m. On exposed rocky banks (Kanai, Hara & Ohba 726365, TI); Gopte–Thale Patil, alt. 3200 m. On exposed rock (Kanai, Hara & Ohba 726366, TI); Thale Patil–Hile Dhap, alt. 3400 m. On exposed bank (Kanai, Hara & Ohba 726367, TI); Thale–Dunche, about 1 km below Dunche, alt. 2000 m. On exposed rock surface (Kanai, Hara & Ohba 726025, TI); Trisuli Khola–Singum Gompa, alt. 2200 m. On rocks (Kanai, Hara & Ohba 726027, TI); Dunche, alt. 6600 ft. On shady and moist rocks. Flowers green (Malla 6577, BM); Chilime Kharka, alt. ca. 16000 ft. (Polunin 1422A, BM); loc. cit. alt. 13000 ft. Rocky places. Flowers red (Polunin 1416, BM); loc. cit. alt. 15–16000 ft. Rock face. Folowers red (Polunin 1273, BM); Oo kharka, alt. 3100 m. On rock. Petal purple (Kanai & Shakya 92, TI); Lantang. Rocky bank in forest. Flowers green (Polunin 598, BM); Lantang–Birdim, alt. 9500 ft. Rocks. Flowers green (Polunin 717, BM); Sringi Himal, Shiar Khola, alt. 15000 ft. (Gardner 631, BM); loc. cit., alt. 17000 ft. Flowers deep wine red (Gardner 637, BM); Taglung, S. of Tukucha, Kali Gandaki, alt. 11000 ft. Open grass slopes. Corolla and filaments dark red (Stainton, Sykes & Williams 1727, BM); Sangdah, N. of Tukucha, alt. 14000 ft. Open stony slopes. Corolla and filaments dark red; anthers green (Stainton, Sykes & Williams 7324, BM); Samargaon, N. of Tukucha, alt. 15500 ft. Open rocky slopes. Inflorescences red (Stainton, Sykes & Williams 7291, BM); Tukucha, Kali Gandaki, alt. 12000 ft. Open grass alp. Inflorescence green externally, red brown internally (Stainton, Sykes & Williams 1180, BM); loc. cit., alt. 12500 ft. Open grassy slopes. Corolla and filaments dark red; anthers green (Stainton, Sykes & Williams 1918, BM); Jargeng Khola, alt. 16000 ft. On rocks. Flowers bright crimson (Lowndes 1142, BM); Thumje, alt. 3300 m (S. Nakao s.n., KYO); Thaple Himal, alt. 4500 m (Nakao s.n., KYO, TNS); Thinigaon, Muktinath Himal, alt. 14500 ft. Open hill side. Inflorescence dark red (Stainton, Sykes & Williams 1259, BM); Bhurchula Lekh, near Jumla, alt. 11–11500 ft. Open slopes. Sepals green; petals green without, red within; filaments red; anthers green (Polunin, Sykes & Williams 4606, BM); Namdo, N. of Mustang, alt. 17000 ft. On gravel at edge of stream. Inflorescence dark red (Stainton, Sykes & Williams 2349, BM); de Beding aux Patuiages, alt. 3900 m. Rochers exp. Sud (Zimmermann

1431, BM); Khangsar, alt. 12500 ft. In tussocky grass on banks of a stream. Flowers reddish green (Lowndes 1233, BM); near Pudamigaon, Suli Gad, alt. 12500 ft. Among rocks. Flowers dull pinkish (Polunin, Sykes & Williams 2242, BM); Rambong, Lamjung Himal, alt. 13500 ft. Growing from rock crevice. Sepals green; petals red; anthers green-yellow (Stainton, Sykes & Williams 6114, BM); Tilicho Pass path, alt. 15800 ft. Growing in wet mud among boulders in river (Barclay & Synge 2627, K); Choker, alt. 16000–18000 ft. Flowers dark red turned black (Dhwoj 382, E); Soongoorey, alt. 13000 ft. (Dhwoj 243, BM); Rambrong, Lamjung Himal, alt. 13000 ft. On open slopes. Petals red internally (Stainton, Sykes & Williams 6084, BM, TI); near Bolangra Pass, alt. ca. 13000 ft. Among rocks in crevices of ledges. Flowers red, stems more or less reddish especially near the top. Stamens with greenish anthers (Polunin, Sykes & Williams 2558, BM); Sulo Khola, alt. 15000 ft. Growing on open slopes. Stems red. Leaves glaucous green or tinged red (Polunin, Sykes & Williams 3487, BM); Phoksunde Khola, alt. 12000 ft. (Shrestha 5362, BM); Maharigaon, alt. 10500 ft. Growing on vertical mossy trunks of cliff in *Betula*-forest. Flowers red (Polunin, Sykes & Williams 189, BM); Sabze Khola, alt. 13500 ft. On rocks (Lowndes 1209, BM); loc. cit., alt. 12500 ft. Top of a big boulder. Flowers dull red crimson. Leaves glaucous (Lowndes 1085, BM); near Dogadi Khola, alt. 12500 ft. Open slopes in ravines; among rocks. Flowers brownish (Stainton, Sykes & Williams 3233, BM); near Chalike Pahar, alt. 15000 ft. Grass slope. Flowers reddish (Stainton, Sykes & Williams 3774, BM, TI); above Sauwala Khola, alt. 12500 ft. Rock ledges. Flowers dark red. Pedicels dark red (Stainton, Sykes & Williams 2992, BM); Tinki Dzong, alt. 16500 ft. Stony soil. Flower dull red (Hingston 336, K); Chumba, Khumbu, Phorche Khola, alt. 13000 ft. In crevices or on trees. Flowers dull red (Bowes-Lyon 2154, BM); Maghang Khola, E. of Num., Arun Valley, alt. 10600 ft. On rock ledges. Corolla and filaments red; anthers yellow (Stainton 832, BM); Topke Gola, alt. 3600 m. On mossy rock by stream. Flowers purplish red; anthers before anthesis deep red (Kanai, Ohashi, Iwatsuki, Ohba, & Shakya 726017, TI); Topke Gola–Jalang Chhyongo, alt. 3800 m. On rock. Flowers dark purplish red (K. O. I. O. & S. 726018, TI); Thudam–Lama Chungbu, alt. 3600 m. On rock. Flowers purplish red (K. O. I. O. & S. 726019, TI); Thudam–Kipudonsu, alt. 4000 m. On rocks. Flowers dark purple (K. O. I. O. & S. 726021, TI); Phujeng La–Topke Gola, alt. 3800 m. On exposed rock. Flowers reddish purple (K. O. I. O. & S. 726022, TI); Topke Gola–Shewaden, alt. 3150 m (K. O. I. O. & S. 726024, TI); Sangjin Bhanjyang–Serpagaon, alt. 8500 ft. On shady rocks (Malla 9020, BM); Mahalangur Himal, Khumbu. Moraines of Khumbu Glacier near Lobuche, alt. 4950 m (Poelt 6233, BM); Surkhet, alt. 9500 ft. Herb on shady and moist slope. Flowers pinkish white (Banerji & Shakya 5617, BM); Chiami (King's collector s.n., CAL). Sikkim. 11–12000 ft. (Hooker 878, CAL); regio. temp. alt. 11–13000 ft. (Hooker s.n., K, CAL); Lachung Valley, Meumtong, alt. 11000 ft. (Gammie 987, CAL); Keydoon, alt. 6500 ft. (King's collector s.n., CAL); Tallum Pandong, alt. 12000 ft. (King's collector s.n., CAL); Megutang–Nayatang (Hara, Kanai, Murata, Togashi & Tuyma 6668, TI); Tosa, alt. 14000 ft. (Ribu & Rhomoo 4483, CAL); Narthu La, Chola Range,

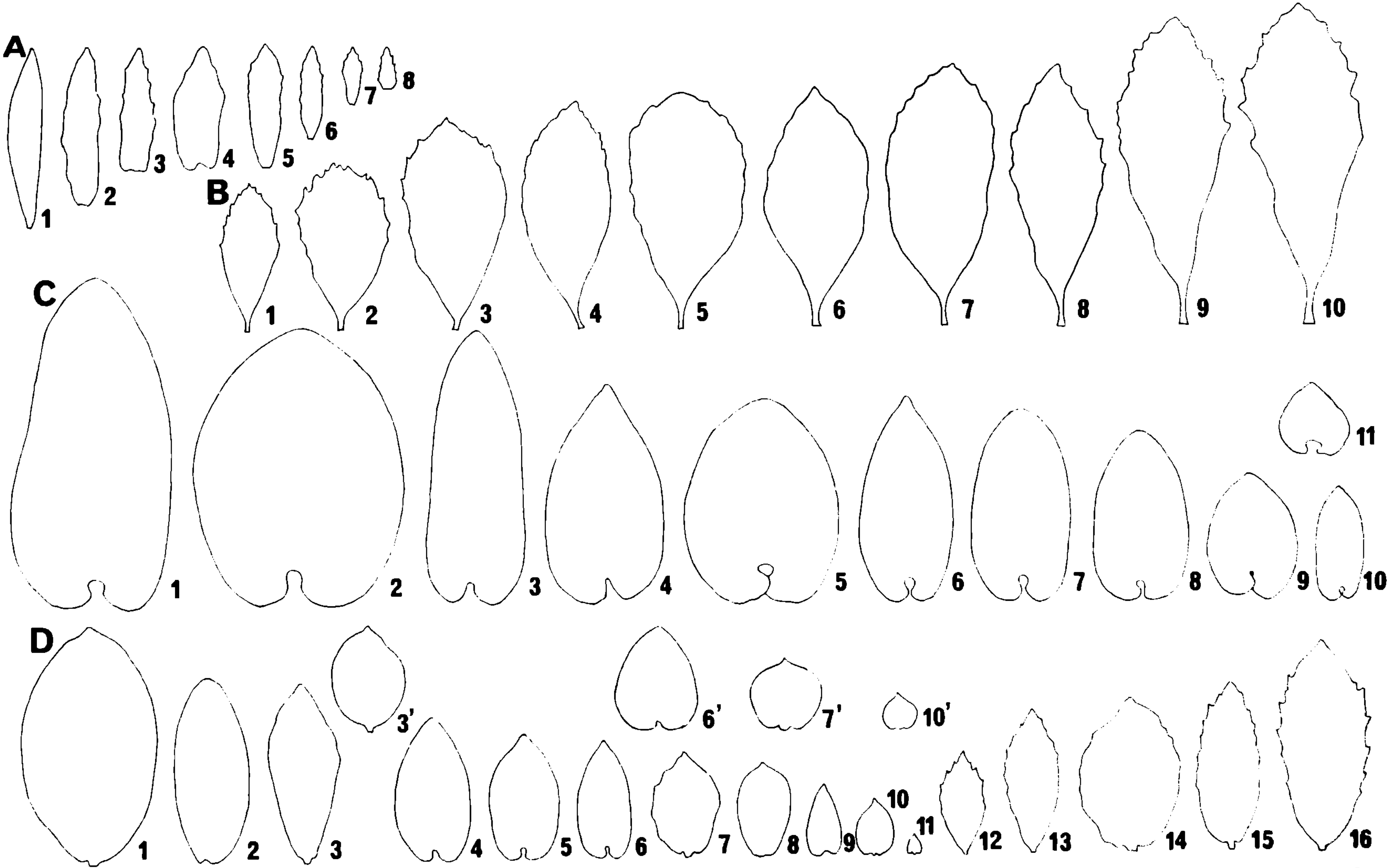

Fig. 44. Variation of leaf in *Sedum bupleuroides* Wall. ex Hook. f. et Thoms., all × 1/2. A_1. Kanai, Hara & Ohba 726363, A_2. Wallich 7233A, A_3. K. H. & O. 726364, A_4. Malla 6577, A_5. Stainton, Sykes & Williams 6114, A_6. S. S. & W. 7271, A_7. Polunin 1416, A_8. Lowndes 1233. B_{1-10}. Kanai, Ohashi, Hara, Iwatsuki & Ohba 726025. C_{1-11}. Kanai, Hara & Ohba 726025. D_1. Stainton 832, D_2. Banerji & Shakya 5617, $D_{3,3'}$. Polunin, Sykes & Williams 2558, D_4. Wallich 7229, D_5. Polunin 717, $D_{6,6'}$. Malla 9020, $D_{7,7'}$. Stainton, Sykes & Williams 3233, D_8. Polunin 1273, D_9. Polunin 598, $D_{10,10'}$. S. S. & W. 2349, D_{11}. S. S. & W. 1259, D_{12}. S. S. & W. 3774, D_{13}. S. S. & W. 6084, D_{14}. Polunin, Sykes & Williams 4606, D_{15}. P. S. & W. 189, D_{16}. P. S. & W. 4604.

alt. 14000 ft. (Gammie 1323, CAL); Rishenang, alt. 13000 ft. (Ribu & Rhomoo 4511, CAL); Lacheng Valley (Gammie s.n., CAL); Samdong (Prain's collector 219, CAL); Nuttung (King's collector 4354, CAL); Phalut, alt. 3900 m. Flowers dark red (Hara, Kurosawa & Ohashi s.n., TI); loc. cit. On more or less shaded floor of *Rhododendron Hodgsonii*-forest. Flower dark purple or purplish red (Kanai, Ohashi, Hara, Iwatsuki & Ohba 726030, TI); loc. cit. On exposed rocky slopes. Flowers dark purple (K. O. H. I. & O. 726029, TI); Phalut–Singalila, alt. 3600 m (K. O. H. I. & O. 721411, TI). Tibet. (King's collector s.n., CAL); Yem-la. (King's collector s.n., CAL); Yunso near Chumbi. Flowers red (King's collector s.n., CAL); Phari, alt. 14000 ft. (Cave s.n., E); Valley to east or Yangu, alt. ca. 13700 ft. (Younghusband s.n., CAL); Lingmootang, Chumbi (King's collector s.n., CAL); Kambazong (Prain s.n., CAL); Go-ling-te-yang near Chumbi. Flowers red (King's collector s.n., CAL); Kongbo, Tamnyen La, alt. 11500 ft. On mossy banks of stream. Calyx, petals & filaments crimson; anthers reddish brown; glands very dark crimson; carpels crimson (Ludlow, Sherriff & Taylor 4937, BM); Kongbo, Kyikar, alt. 9700 ft. On dry gravelly banks in *Quercus-Ilex*-forest (Ludlow, Sherriff & Taylor 5311, BM); Kongbo, Valley above Tripe, alt. 10000 ft. On dry soil bank. Plant up to 2 feet. Sepals, petals, filaments & carpels green; anthers yellow (Ludlow, Sherriff & Taylor 5392, BM); Kangbo, Tamnyen Chu, alt. 10000 ft. (Ludlow, Sherriff & Taylor 4973, TI); near Trashirake (Kawaguchi s.n., TI). Bhutan. Cheka–Tremo La, alt. 4000 m (Nishioka s.n., TI); Me La, south side, alt. 14500 ft. Scree. Flowers opening brown becoming somewhat yellow (Ludlow, Sherriff & Hicks 20351, TI); Chumolari, alt. 16000 ft. (Rohmoo Lepcha 524 & 526, E); head of western branch of Pho Chu, alt. 14000 ft. On wet rocks. Calyx and corolla green at base, tipped dark brown; filaments and anthers yellow; ovary and styles green (Ludlow, Sherriff & Hicks 16620, BM, TI); Lunma, Kung Richen Tzo, alt. 16500 ft. Rocky soil. Flowers pale green tipped deep red (Bowes-Lyon 3463, BM). Yunnan. A-tun-tsu, alt. 14500 ft. On rocks, etc. (Kingdon-Ward 985, E); loc. cit., alt. 13000 ft. On rocks (Kingdon-Ward 564A, E); Eastern flank of the Lichiang Range. Lat. 27° 20′ N, alt. 9000–10500 ft. Dry, stony, open situations, ledges of cliffs, etc. Flowers reddish-brown; anthers green (Forrest 2441, E); Eastern flank of the Lickiang Range, Lat. 27°15′ N. Open mountain pasture. Flowers deep reddy (Forrest 5690, E). Burma. Upper Burma, 26°24′ N, 98°48′ E, alt. 13000 ft. On humus covered boulders and ledges of cliffs (Forrest 27114, K).

Sedum bupleuroides is one of the most polymorphic species in the subgenus Rhodiola and has been variously delimited. Moreover, several closely allied species have hitherto been described as distinct from *S. bupleuroides* mainly based on the shape of leaf and the degree of papillation. Praeger (1921) recognized five species as closely allies, i.e. *S. bhutanense* Praeger (or *S. bhutanicum* Praeger), *S. bupleuroides* Wall. ex Hook. f. et Thoms., *S. discolor* Franch., *S. elongatum* Hook. f. et Thoms., non Ledeb. and *S. purpureoviride* Praeger. While Fröderström (1930) considered seven species, i.e. the five species mentioned above plus *S. rotundatum* Hemsley and *S. subopposiitum* Maxim., as conspecific and recognized four varieties within *S. bupleuroides* i.e. var. *bupleuroides*, var. *discolor*, var. *purpureoviride* and var. *rotundatum*.

Having examined a large number of materials both in herbaria and in field, I consider that *S. bhutanense* and *S. elongatum* are conspecific with *S. bupleuroides* as already treated by Fröderström (1930), and that both *S. purpureoviride* and *S. discolor* are distinguishable specifically from *S. bupleuroides*. Also, *S. rotundatum* is regarded as conspecific with *S. crenulatum*. But I could not study satisfactorily on *S. subopposítum*.

Variation on the shape and size of leaves of *S. bupleuroides* as defined above are illustrated in Fig. 44. Two examples of the variation within a population are included in the figure (B & C). The C of Fig. 44 shows the variation within a relatively small population of C. Nepal. The population was found on the exposed surface of a sedimental rock along the valley near Dunche (alt. 2100 m) together with such small shrubs and herbs as *Coriaria nepalensis*, *Benthamidia capitata*, *Toricellia tiliaefolia*, *Thalictrum rotundifolium*, *Iris decora*, etc. In the population, the leaves of *S. bupleuroides* are narrowly oblong-ovate to typically oblong-ovate or ovate and always entire along the margin, and their sizes vary from 2 to 9 cm in length and from 1.3 to 5.8 cm in width. These plants quite agree with the type material of *S. bupleuroides*, i.e. Wallich 7229 from 'Gosain Than', as shown in the same figure (Fig. 44, D_4). While, the B of the figure shows the variation within a relatively scattered population. The population was spread on exposed windswept stony grassland and rarely extending continuously in *Rhododendron Hodgsonii*-forest along the ridges of Mt. Singalila near Phalut (alt. 3900 m). The leaves of *S. bupleuroides* in the population are narrowly oblong-obovate or obovate-elliptic with an irregularly serrate margin, and their sizes vary from 4 to 9.6 cm in length and from 1.8 to 3.5 cm in width. These plants well agree with *S. bhutanense*. In these two examples, the variation in the shape of leaves of *S. bupleuroides* is recognizable as relatively stable within each population. However, I could not find any discontinuous populations of the species as shown in the figure.

Sedum discolor Franchet in Journ. de Bot. **10**: 285 (1896)-Praeger in Not. Bot. Gard. Edinb. **13**: 78 (1921), cum add. descript., pro parte; incl. specim. 'Cooper 26 et 128' cit., sed excl. pl 173 etiam excl. specim. 'Forrest 2441 et 5690' cit. quae *Sedum bupleuroides* Wall. ex Hook. f. et Thoms.-Fröd. in Act. Hort. Gothob. **1**: 29 (1924), verisim. [Plate 10c; Fig. 45]

Sedum tibeticum Hook. f. et Thoms. sensu Praeger in Journ. Roy. Hort. Soc. **46**: 49 (1921), incl. fig. 17.

Sedum bupleuroides Wall. ex Hook. f. et Thoms. var. *discolor* (Franch.) Fröd. in Act. Hort. Gothob. **5**: append. 45 (1930); in Hand.-Mzt., Symb. Sin. **7**: 407 (1931).

Rhodiola discolor (Franch.) Fu in Act. Phytotax. Sin. Addit. **1**: 124 (1965).

Sedum euphorbioides Franchet in sched., non Schlecht. ex Ledeb. (1843).

A perennial herb, up to 25 cm high. Rhizomes nearly cylindrical, elongate, usually 0.7–1.4 cm thick, 2–5 cm long, well branched, pale brown, solid, the base continuous to the long cylindrical root (usually up to 15–20 cm), the branches (rhizomatoclades) slender in the beginnings, cylindrical, 3–4 mm across, but gradually accrescent and branching afterwards, the apical part usually epigaeous, usually ascending but often creeping, covered with scaly leaves. Scaly leaves chartaceous, deciduous, nearly erect, usually triangular or triangular-ovate, nearly entire along the margin, round or obtuse at the apex, chestnut-brown or blackish-brown, usually much darker inwards, 1.5–4 mm long 1.5–2.5 mm wide. Flowering stems annual, (1–)2–3 in each rhizomatoclade, simple, terete, glabrous, always epapillate, smooth, pale green or often lacking green shade, usually more or less glaucous, 7–28 cm long, 1.5–2.5 mm thick, the former year's stems occaisionally remaining. Leaves alternate, arranged throughout the stem, spreading widely, sessile, nearly spurless, thick herbaceous, linear-ovate or narrowly oblong-elliptic, usually (9–)15(–25) mm long 2–4 mm wide, usually 4.2–7 times longer than breadth, flattish, glabrous, epapillate, usually triangular in the apical part, usually acute or rarely obtuse at the apex, mostly truncate at the base, remotely and irregularly denticulate along the margin (the teeth 3–5 in number on each side, round at the apex, convex in the basal side, straight or convex in the apical side), deep aeruginose above, pale green and somewhat to conspicuously glaucous beneath, often slightly reddish at the apex, in the basal leaves usually reddish or browhish on both surfaces, the costa more or less prominent beneath, the lateral veins obscure, 3–5 on each side of the costa, first nearly parallel and diverging from the middle towards the margin, the veinlets anastomosing. Inflorescences terminal, 6–20-flowered, hemispherical or rather flattish, 1.5–3 cm across, more or less bracteate, forming a compound-corymb; the cluster usually 4–7 in number, consisting of (1–)3 flowers; peduncles 2–4 mm long, often reddish, glabrous, epapillate; pedicels usually slightly longer than the peduncle, 3–7 mm long; bracts leafy, comparatively few, very similar to the upper cauline leaves in shape, usually 5–15 mm long 1–3 mm wide. Flowers in middle June to middle August, dioecious, mostly 5-merous, but occaisionally 4-merous, 6–8 mm (♂) 4–6 mm (♀) across at anthesis, the alabastrum deep purple or reddish purple, ovoidal. Calyx (3–)3.5–5(–5.5) mm long, glabrous, the tube saucer-shaped (♂) or funnel-shaped (♀), the base more or less tapering to the pedicel, nearly equalling the lobes or shorter, usually green, in female more or less rigid; the lobes 2.5–3 mm long 0.8–1.4 mm wide, usually equalling nearly a half of the petal (♂) or nearly 2/3 of the petal (♀) in length, long- or slightly concaved-triangular or narrowly triangular-ovate or subulate, entire along the margin, usually round or obtuse but rarely truncate or subacute at the apex, somewhat round outside, flattish inside, ascending at anthesis, appressed to the ovaries in female, usually deep red or dark purplish red. Petals distinct, dark purplish red or deep purple, more or less fleshy, usually oblong-elliptic to narrowly oblong-ovate (♂), oblong to narrowly oblong-ovate (♀), usually 5–6 mm long 1.7–2 mm wide (♂), usually 3–4 mm long 0.9–1.2 mm wide (♀), entire along the margin, mostly obtuse at the apex, shallowly boat-shaped (♂) or flattish (♀), glabrous, spreading to widely spreading at anthesis. Stamens distinctly shorter than the petal (equalling the 3/4–5/6 of the petal), ascending or erect at flowering; filaments subulate, more or less fleshy, obcompressed, glabrous, dark purplish red or deep purple, deeper towards the apex, about 0.4 mm wide at the base, the epipetalous ones inserted about 1.2 mm from the base, 3.5–4 mm long, the alternipetalous ones 4.5–5.5 mm long; anthers basifixed, globosal, usually 0.4–0.5 mm across, slightly retuse at the apex, before anthesis dark purple or dark purplish red, after dehiscence turning yellow. Nectar-scales oblong or square or square-ovate, usually very shallowly retuse at the apex, usually flattish but often recurved in the upper 1/4 part, round inside, concaved outside, conspicuously deep red purple but often pale below a third, 0.7–1.2 mm long 0.4–0.8 mm wide 0.15 mm thick. Gynoecium of female plants usually 7–9 mm long (twice to thrice of the petal in length), sessile, connate ventrally 1.8–2.5 mm from the base, erect, red purple, the connected part adnate to the calyx-tube dorsally; the ovary oppsite to the calyx-lobe and nectar-scale, straight but in the upper part abruptly outcurved ventrally, slightly round dorsally, usually broadest near the middle, 1.5–1.7 mm wide, the style very short, about 0.6 mm long, straight or oblique, very deep purple in the upper half, the stigma inconspicuous, mostly epapillate; the placenta nearly marginal. Gynoecium of male plants usually 2.5–3 mm long, distinctly shorter than the petal and stamen. Ovules of female plants usually 10–14 in each locule, ascending to descending, ellipsoidal, somewhat elongate in the apical part, obtuse at the apex, usually 0.6–0.7 mm long, the funicles about 0.1 mm long; ovules of male plants (0–)2–8 in each locule, about 0.3 mm long, ellipsoidal, round at the apex, probably abortive.

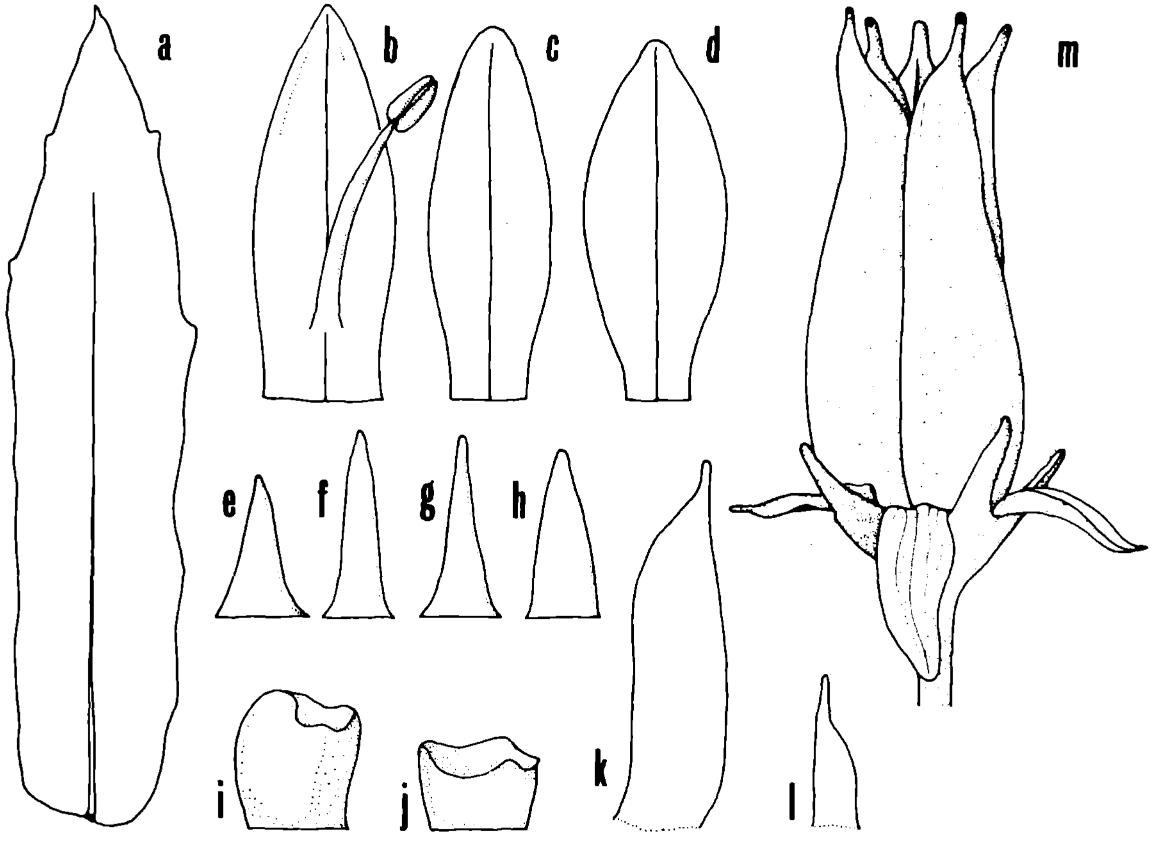

Fig. 45. *Sedum discolor* Franch. a. Leaf, × 3.75, b. Petal of male flower with stamen, × 7.5, c & d. Petals of female flower, × 7.5, e–h. Calyx-lobes, × 7.5, i & j. Nectar-scales in dorsal view, × 15, k. Pistil in lateral view, × 7.5, l. Abortive pistil of male flower in lateral view, × 7.5, m. Female flower, × 7.5. (Kanai et al. 726332).

Follicles 8–10 mm long, erect, reddish brown. Seeds chestnut- or blackish brown, narrowly ellipsoidal with long elongate apex, 2.5–3 mm long.

Distr. Nepal, Sikkim, and Yunnan.

Specimens examined. Nepal. Gosainkund Lake, alt. 4260 m. Stem reddish at the top part (Kanai & Malla 674918 ♀, TI); Gosainkund, alt. 4200 m. On scree (Kanai, Hara & Ohba 726336 ♀, TI); loc. cit. alt. 4400 m. On rocks (Kanai, Hara & Ohba 726338 ♀, TI); Mul Kharka, Chilime Khola, alt. 3800–4100 m. Petals purple (Kanai & Shakya 672268 ♂, TI); Sargadangka, alt. 12000 ft. Flower blue (Sharma E82 ♂, BM); Tangba, alt. 14–15000 ft. (Dhwoj 211 ♂, BM); By Hongku Khola, 27°30′ N, 86°45′ E, alt. 14000 ft. In short turf. Flowers dark maroon (Mc Cosh 349 ♂, BM, TI); Dudh Kosi, Lumding Khola, 27°88′ N, 86°41′ E, alt. 12000 ft. On rocks. Flowers dark red (Staiton 4615 ♂, BM, TI); Saju Pokhari, alt. 4000 m (Kanai, Ohashi, Iwatsuki, Ohba & Shakya 726332 ♀, TI); Below Jalang Chhyongo, alt. 3900 m. In dwarf shrubs of *Rhododendron setosum*, *R. Anthopogon*, etc. In moraines. Flowers deep purple-red; glands dark reddish purple; anthers deep red (K. O. I. O. & S. 726333, TI); Kipudonsu–Kipuphu, alt. 4400 m. On boulders (K. O. I. O. & S. 726335 ♂, TI). Sikkim. Changu, alt. 12500 ft. Amongst mossy boulders in old river bed (Cooper 26 ♂, E); Migotang, alt. 3900 m (Hara, Kanai, Murata, Togashi & Tuyama 6677 ♀, TI); along the Choktsering Chu, N. of Jongri, alt. 4000–4500 m (H. K. M. T. & T. 6670 ♀, TI). Yunnan. (Delavay 3691 ♀, P–Syntype of *Sedum discolor* Franch.); Lao-long-tong, Ho-kin, alt. 3500 m. Lisieres des bois. Fleurs rougeatre (Delavay 3771 ♀, P–Lectotype of *Sedum discolor* Franch.).

This species is closely related with *Sedum bupleuroides*, but differs clearly from the latter in having deciduous scaly leaves, narrower leaves, longer petals, longer stamens, etc. These differences are summarized as follows:

	S. discolor	*S. bupleuroides*
Rhizomes	slender, well branched, ascending or creeping	more or less massive, fewer branched, nearly erect
Scaly leaves	deciduous	persistent
Leaves	linear-ovate or narrowly oblong-elliptic, 0.9–2.5×0.2–0.4 cm in size	narrowly to broadly elliptic, ovate or obovate to nearly circular, 0.3–9.5×0.4–4.5 cm in size
Petals	5–6×1.7–2 mm (♂) 3–4×0.9–1.2 mm (♀) in size	2.8–4×1.2–1.6 mm (♂) 1.5–3×0.5–0.7 mm (♀)
Alternipetalous filaments	4.5–5.5 mm long	3–4 mm long
Anthers	0.4–0.5 mm long	0.5–0.7 mm long
Connected part of gynoecia (♀)	1.8–2.5 mm	1.2–1.7 mm

This species is somewhat similar to *S. tibeticum* Hook. f. et Thoms., but differs from the latter in having slenderer and well branched rhizomes, diciduous scaly leaves, thick herbaceous and remotely denticulate leaves, etc.

In E. Nepal, I could find this species on boulder drift occupied by low bushes of *Rhododendron Anthopogon*, *R. setosum*, etc. It is notable that this species was always found with *Sedum himalense*. While in C. Nepal, I could find this species on steep rocky slopes near the summit of Mt. Gosainkund where are exposed to the strong effect of wind and desiccation, and are commonly occupied by *Astragalus* sp., *Anaphalis* sp., etc. Based on these observation, I consider *S. discolor* is associated with both alpine heath and windward grassland vegetation. This *Sedum*, therefore, seems to be terrestrial.

Sedum callianthum H. Ohba in Journ. Jap. Bot. **49**: 325, fig. 1 g-l (1974). [Plate 10a; Fig. 46]

A perennial herb up to 20 cm high. Rhizomes nearly cylindrical, solid, up to 3 cm long, 1.2–1.5 cm in diameter, pale lurid, the base tapering to the slender dauciformed root (up to 40 cm long), the upper part densely covered with scaly leaves. Scaly leaves chartaceous, pale rufous, 6–10 mm long 5–12 mm wide, though considerably variable in shape usually triangular to widely or ovate-triangular or depressed trullate, obtuse at the apex, entire along the margin, persistent. Flowering stem annual, 3–5 in number, arising usually 7–10 cm long, 1.7–2 mm thick, nearly erect to ascending, simple, terete, rather sparsely leaved (8–12), glabrous, pale purplish red. Leaves subopposite, petiolate; the petiole 2–3 mm long, almost spurless, somewhat obcompressed, glabrous; the lamina thick herbaceous, flattish, narrowly rhombic-ovate to rhombic-ovate or elliptic to narrowly elliptic, obtuse or deltoid-obtuse at the apex, attenuate and gradually tapering into the petiole at the base, 20–42 mm long 5–20 mm wide, 2–4 times longer than broad, very sparsely minutely papillate (the papillae pellucid and less than 0.1 mm long), glabrous and somewhat lustrous above ca. 2/3 parts crenulate-serrate along the margin but the rest part nearly entire. Inflorescences terminal, bracteate, scatteringly 20–35-flowered, forming a compound-dichasium, the cluster 3, usually with 2–3 dichasia and sometimes a monochasium; peduncles 5–15 mm long, nearly terete, glabrous but under a lens (×ca. 40) sparsely or scarcely papillate, the papilla less than 0.1 mm long; bracts fewer in number, 3–30 mm long 0.6–12 mm wide, very similar to the upper cauline leaves in shape but often smaller in size linear sessile, round or obtuse at the apex, nearly entire along the margin; pedicels 1.2–2.5 mm long, glabrous, scarcely papillate under a lens (×ca. 40). Flowers in June, mostly 5- or rarely 4-merous, dioecious(?), about 5 mm in diameter at anthesis. Calyx 1.8–2.4 mm long, fleshy and thick, glabrous, green, the tube about 0.5 mm long, the lobes 1.3–2 mm long 0.6–1.3 mm wide, ovate to narrowly or very broadly or ovately triangular, obtuse to truncate at the apex, entire or often sparsely sinuolate upwards along the margin, shallowly convex outside but nearly flattish inside, the veins not prominent. Petals purple, distinct, valvate in bud, spreading horizontally at anthesis, somewhat fleshy, narrowly obovate (SADT n. 46) to obovate (SADT n. 47) or elliptic, round or shortly mucronulate-obtuse at the apex, usually nearly entire but often very minutely erose upwards along the margin, 3–4.5 mm long 0.8–1.5 mm wide, 3–3.3 times longer than breadth. Stamens mostly equalling 2/3–3/4 of the petal, erect or ascending at anthesis; filaments subulate, obcompressed, glabrous, about 0.4 mm at the base, pale purplish, the epipetalous ones inserted about 0.6 mm above the base and 1.5–1.7 mm long, the alternipetalous ones usually 2.5–3 mm long; anthers basifixed, very narrowly ovoidal with nearly round or somewhat retuse apex, 0.5–0.7 mm long, before anthesis deep purplish red, after dehiscence yellowish. Nectar-scales 0.8–1.2 mm long 0.3–0.4 mm wide, narrowly obovate with round apex, flat, entire along the margin, deep purple or purplish red. Gynoecium usually 2–2.5 mm long, connected ventrally about 0.1–0.2 mm from the base, the ovary erect, not gibbous ventrally, dorsally tapering to both ends from the middle, the style indistinguishable, the stigma epapillate; the placenta nearly marginal. Ovules always 2 in each locule, usually descending, ellipsoidal with somewhat elongate apex, the tip itself round, about 0.4 mm long, probably abortive(?).

Distr. C. and E. Nepal.

Specimens examined. Nepal. Rolwaling, 27°55′ N, 86°23′ E, alt. 14000 ft. In rock ledges. Flowers purplish red (J.D.A. Stainton 4703, BM–Holotype of *Sedum callianthum* H. Ohba, TI–Isotype); Langtang, alt. 12500–13000 ft. Overhanging rock. Flowers brownish red (Polunin 200, BM).

Sedum callianthum is closely related with *S. bupleuroides* Wall. ex Hook. f. et Thoms. in having purplish red flowers, persistent scaly leaves, narrower nectar-scales, etc., but differs in having slenderer rhizomes, broader scaly leaves, narrowly obovate to obovate or elliptic petals, etc. On the contrary, *S. callianthum* is distinguishable

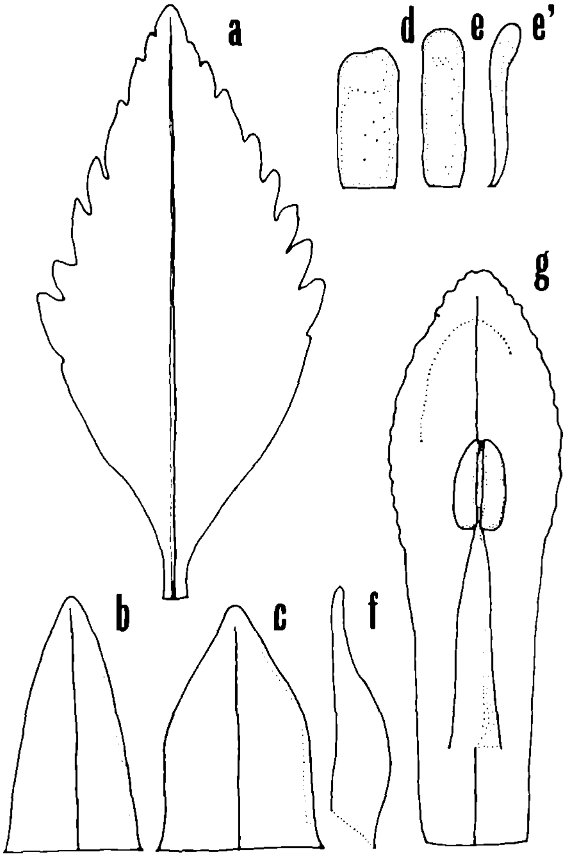

Fig. 46. *Sedum callianthum* H. Ohba. a. Leaf, × 1.5, b & c. Calyx-lobes, × 15, d & e. Nectar-scales in dorsal and lateral (e′) views, × 15, f. Pistil in lateral view, × 15, g. Petal with stamen, × 15. (a & b. Polunin 200, c–g. Stainton 4703).

from *S. ovatisepalum* (R.-Hamet) H. Ohba and *S. sacrum* (R.-Hamet) H. Ohba in having purplish red flowers and persistent scaly leaves.

Sedum linearifolium Royle, Ill. Bot. Himal. 222, t. 48, fig. 1 (1835)–Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 100 (1858)–C. B. Clarke in Hook. f., Fl Brit. Ind. **2**: 420 (1878), incl. var. *typica* et var. *pauciflorum*–R.-Hamet in Act. Hort. Gothob. **2**: (339–) 394 (1926), pro parte, incl. var. *genuinum* et var. *sinuatum*, sed excl. var. *ovatisepalum*, var. *Balfourii*, var. *Tieghemi*, var. *Dielsianum* et var. *sacrum*–Fröd. in Act. Hort. Gothob. **5**: append. 50 (1930), pro parte, incl. var. *genuinum* et var. *sinuatum*, sed. excl. var. *ovatisepalum*, var. *Balfouri*, var. *Tieghemi*, var. *Dielsianum* et var. *sacrum*–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930), incl. var. *sinuatum*, sed excl. var. *ovatisepalum*, var. *Balfouri*, var. *Tieghemi*, var. *Dielsianum* et var. *sarcum*–Weibel in Candollea **16**: 144 (1958), pro major parte. [Plate 3d; Fig. 47]

Sedum sinuatum Royle [Ill. Bot. Himal. 222 (1835), nom. nud.] ex Edgew. in Trans. Linn. Soc. London **20**: 47 (1846).

Sedum mucronatum Edgew. in Trans. Linn. Soc. London **20**: 48 (1846).

Sedum pauciflorum Edgew. in Trans. Linn. Soc. London **20**: 49 (1846)–Hook. f. et Thoms., loc. cit. 100 (1858).

Sedum trifidum Wall. [Cat. no. 7230 (1832), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 100 (1858), nom. illegit., pro major parte–C. B. Clarke, loc. cit. 420 (1878), pro parte–Masters in Gard. Chron. new ser. **10**: 267 (1878), versim. pro minor parte.

Sedum linearifolium Royle var. *pauciflorum* (Edgew.) C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 420 (1878).

Sedum linearifolium Royle var. *sinuatum* (Royle ex Edgew.) R.-Hamet in Act. Hort. Gothob. **2**: 394 (1926)–Fröd., loc. cit. 52 (1930), pro major parte; in Hand.-Mzt., Symb. Sin. **7**: 405 (1931), versim. excl. specim. cit.–Berger, loc. cit. 442 (1930)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 141 (1955), pro parte.

Rhodiola linearifolia (Royle) Fu in Act. Phytotax. Sin. Addit. **1**: 126 (1965), non A. Boriss. (1939).

Rhodiola sinuata (Royle ex Edgew.) Fu in Act. Phytotax. Sin. Addit. **1**: 127 (1965).

Rhodiola trifida (Wall. ex C. B. Clarke) Jacobsen, Sukkulent. Lex. 291 (1970), sine relat. loc.

Rhodiola Fui A. Boriss. in Novit. Syst. Pl. Vasc., Acad. Sci. URSS **6**: 114 (1970), in adnota.

A perennial herb, usually 15–25(–30) cm high. Rhizome slender, the hypogaeous part creeping, up to 20 cm long, 2–5 mm thick, sparsely branched, the epigaeous part usually 1–2 cm long, 3–5 mm thick, but sometimes accrescent more, erect or ascending, the apical part crowned by scale-leaves. Scaly leaves chartaceous rather caducous, triangular or triangular-ovate to shallowly concaved triangular with nearly entire margin, acute or obtuse at the apex, 1.5–3(–5) mm long 1–3 (–4) mm wide, blackish brown to chestnut-brown. Flowering stems 1–4(–5) from each apex of rhizome, annual, usually 15–25(–30) cm long, ascending or suberect, simple, terete, glabrous and rather laevis, pale yellowish green, (0.8–)1–2.5

(–2.7) mm thick, the internode always distinctly shorter than the leaf (usually 1/2–3/4), the old flowering stem hardly persistent. Leaves alternate, remotely or moderately arranged throughout, widely spreading, sessile, spurless, thick herbaceous, flattish, yellowish green, very narrowly obovate (SADT n. 45) to linear-obovate, nearly entire to more or less lobulate in the upper 1/3 part of the margin, (1–)1.5–3(–3.5) cm long 0.15–2 cm wide, densely papillate or mamillate along the margin (the papilla or mamilla less than 0.1 mm long), glabrous but sparsely or moderately mamillate above (the mamilla less than 0.05 mm high), nearly laevis beneath, usually acute at the apex, mostly long-attenuate at the base; when lobulate the lobes 3(–5) in number, (1–)2–10 mm long 0.8–2(–2.2) mm wide, linear, widely spreading, entire or rarely sinuolate along the margin, the upper part acute with round or obtuse apex, the sinus between lobes obtuse or truncate or acute; the costa slightly caved under the upper surface, the veins obscure, the lateral-veins 3–5 on each side of the costa, not reaching the margin. Inflorescences terminal, usually (1–)3–9(–13)-flowered, bracteate, usually forming simple corymb-fascicles or a dichasium; the cluster 3(–4) in number; peduncles 6–10(–12) mm long, glabrous, mostly moderately or densely papillate (the papilla usually 0.1 mm long); pedicels 3–6 mm long, mostly densely or rarely moderately papillate; bracts linear-obovate or linear-ovate, 5–15 mm long 2–4 mm wide, sessile, round or obtuse at the apex, long-attenuate at the base, nearly entire but densely papillate or mamilate along the margin (the papilla or mamilla less than 0.1 mm long), both surfaces glabrous but upper one sparsely papillate. Flowers in late July to middle September, hermaphrodite, mostly 5-merous, 8–18 mm wide at anthesis. Calyx 3–5.5 mm long, yellowish green, the tube usually 0.5–1.2 mm long, glabrous and mostly epapillate, the lobes 2–3.3 mm long (1–)1.5–2.2(–2.5) mm wide, usually ovate to narrowly triangular-ovate, usually entire along the margin, mostly in the upper 1/3 part more or less abruptly narrowing, round or obtuse at the apex, gibbous outside and hollowed inside in the lower half, slightly convex outside and flat inside in the upper half, sometimes tinged with red near the apex and/or along the margin. Petals spreading at anthesis, distinct, narrowly ovate (SADT n. 37) to ovate (SADT n. 38) or elliptic (SADT n. 2–3), (6–)7–11(–12) mm long 2–4 mm wide, entire along the margin, at the lower 1/3 part the opposite margins nearly parallel, round or obtuse and often minutely mucronulate at the apex, glabrous and laevis on both surfaces, in the upper 2/3 part boat-shaped, but flattish in the lower 1/3 part, milky white inside, pale greenish white or often tinged slightly with red outside. Stamens always shorter (about 4/5) than the petal, ascending at anthesis; filaments linear-filiform but slightly tapering upward, obcompressed, glabrous, whitish, 0.5–0.7 mm wide at the base, the epipetalous ones inserted usually 2–3 mm from the base and 2.5–3.5 mm long, the alternipetalous ones very shortly (about 0.3 mm) united with the petals or distinct, 5–6.5 mm long; anthers basifixed, ellipsoidal, usually shallowly retuse at the apex, mostly 0.8–1.2 mm long, before anthesis deep red-purple, after dehiscence gradually tinged with deep yellow. Nectar-scales broadly oblong to square, shallowly emarginate or irregularly and minutely retuse or obtusely truncate at the apex, round outside con-

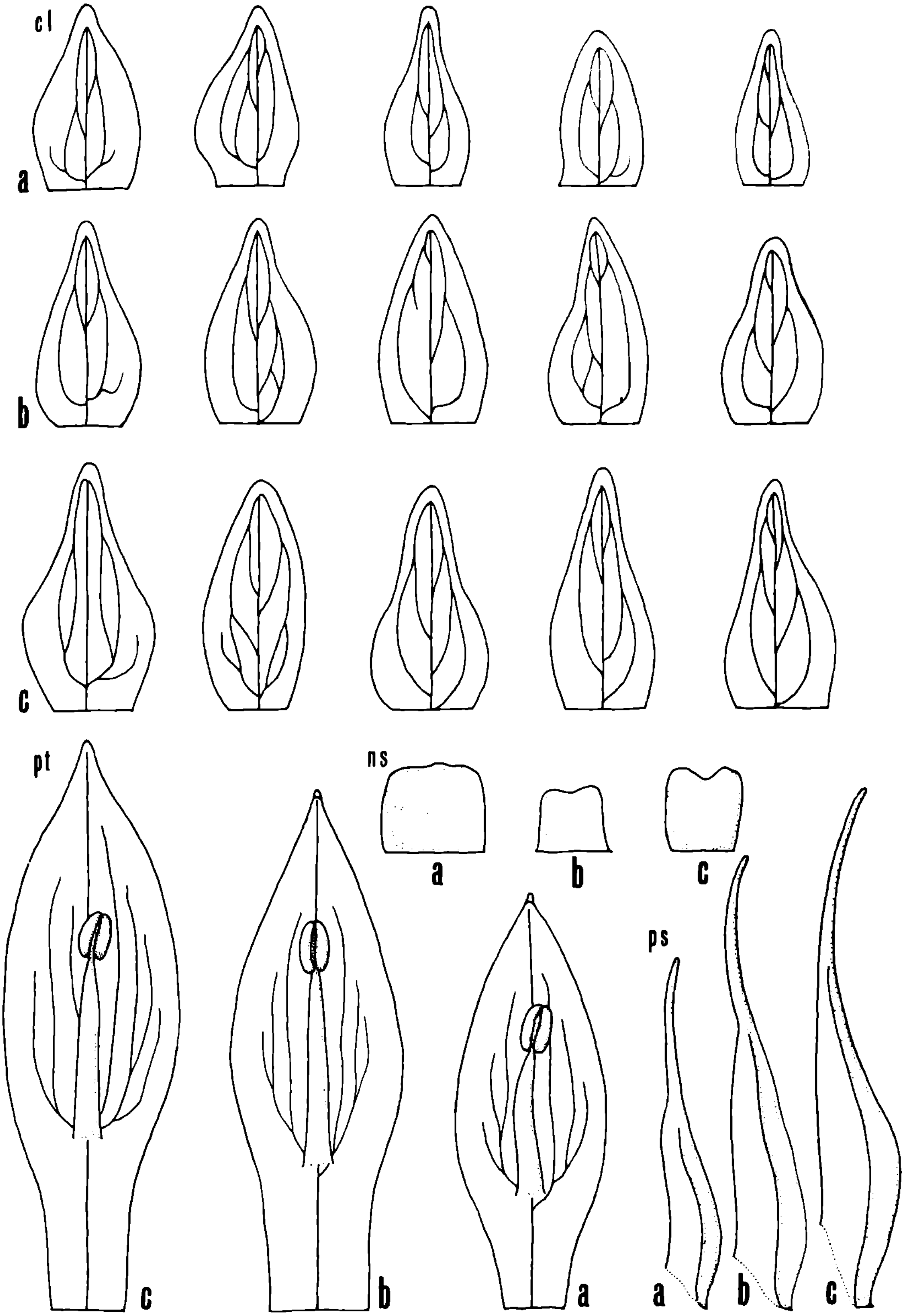

Fig. 47. *Sedum linearifolium* Royle, showing variations of petals, calyx-lobes, nectar-scales and pistils of three flowers within a simple corymb. cl. Calyx-lobes, ×7.5, pt. Petals with stamen, ×7.5, ns. Nectar-scales in dorsal view, ×15, ps. Pistils in lateral view, ×7.5, a & b. Lateral flowers, c. Terminal flower. (Stainton, Sykes & Williams 4709).

caved inside, 0.5–1 mm long 0.4–1.2 mm wide, about 0.2 mm thick, deep or pale yellow. Gynoecium usually 5–10 mm long, white with very slightly greenish shade, slightly connected (0.7–1.5 mm) ventrally at the base, sessile, erect, the ovary not gibbous ventrally, 3.5–5 mm long 0.7–1.3 mm wide, gradually tapering upward from the middle dorsally, the style usually 1.5–3.5 mm long, often slightly outcurved, ending into an epapillate stigma, the placenta nearly marginal. Ovules 12–18 in each locule, descending, ellipsoidal with round or elongate apex, 0.5–0.8 mm long, the funicles about 0.3 mm long.

Distr. Kashmir, Lahore, Kumaon, and Nepal.

Specimens examined. N. W. Himalaya. Kranda, alt. 7–8000 ft. (Edgeworth s.n. in 1844, K–Lectotype of *Sedum pauciflorum* Edgew.); Sirkanda, alt. 8–10000 ft. (Edgeworth s.n. in 1844, K–Lectotype of *Sedum mucronatum* Edgew.); Himalaya bor. occ. regio. temp., alt. 6–8000 ped. (Thomson s.n., K). N. W. India (Herb. Royle, K–Type collection of *Sedum linearifolium* Royle); Jaunsar Bahar, Rocks above Chukrata, Deoban Range, alt. 7–8000 ft. (Duthie herb. no. 1129, K). Lahore. Inanali, alt. 7000 ft. On rocks. White flowered (Bor 15318, TNS). Kumaon. (Wallich 7230B, K–Lectotype of *Sedum trifidum* Wall. ex Hook. f. et Thoms., CAL); Hurdol Pap, alt. 9000 ft. (Strachey & Winterbottom s.n. on Oct. 6, 1848, K); Ralam, alt. 12000 ft. (Strachey & Winterbottom s.n. on Aug. 24, 1848, K); Shobala, Darma Valley (Inayat 24434, K); Mahasu, alt. 6000–10000 ped. On trees (Edgeworth s.n. in 1844, K); Garhwal, Bhyundar Valley, alt. 2400 m. On mossy rock. Flowers white (Bhattacharyya 29340, TI); Mussooree (Herb. Falconer in Herb. late E. India Company no. 477, K); loc. cit., alt. 7000 ped. (Bacon s.n. in 1844, K); loc. cit. Flowers pale pink (Lal s.n., TI); loc. cit. Flowers yellow (Sen s.n., TNS). Nepal. Chaurkot, S.E. of Jumla, alt. 10000 ft. Growing from shady rock crevices. Stems tinged red. Petals white with pink tips. Filaments white, anthers orange (Polunin, Sykes & Williams 5430A, BM); Between Jumla and Garjigath, alt. 10000 ft. Growing from rock crevices. Petals white. Filaments white; anthers brown (Polunin, Sykes & Williams 5022, BM); Near Seng Khola, alt. 11000 ft. Exposed cliff upon ridge. Leaves reddish and succulent. Flowers white, tipped pink (Stainton, Sykes & Williams 4709, BM); Lomgtang, 28°13′ N 85°30′ E, alt. 3200 m. Sur rochers. Fl. blanches (Dobremez 1017, BM); Pongsing, alt. 15000 ft. (Dhwoj 109, BM); Lantang village area, alt. 11500 ft. Walls. Flowers yellow green (Polunin 1603, BM); Between Kurpani and Ghorai, alt. 4000 ft. Growing on rock faces. Flowers white, anthers brown, styles pale mauve (Polunin, Sykes & Williams 1328, BM); Gangja La–Palchock Danda, alt. 10000 ft. Rocks (Polunin 1966, BM); Audessus de Simigaon, en direction du col, alt. 2700 m. Rochers maussus. Fleurs blanches (Zimmermann 1320, BM); loc. cit., alt. 2340 m. Fleurs blanches (Zimmermann 1306, BM)*; Bagmati Zone, Rasuwa District, East Khangyin, alt. 3750 m (Nicolson 2611, BM); Dudkunda, alt. 13000 ft. (Bailey's collector s.n., BM); Kunde, Khumbu, alt. 12750 ft. On rock. Petals white, tipped pink (Horsfall 13, BM)*; Kyangchin Gomba, 28° 13′ N 85° 44′ E, alt. 3750 m. Pelouse. Fleurs blanches (Dobremez 1054, BM)*; Launkinayak, alt. 12000 ft. On open slope of mossy rocks. Flowers reddish white (Shrestha & Shakya 3804, BM)*; Bagmati Zone, Sindhu Palchok District, below Helumbu, alt. 2500 m.

Locally abundant on moss covered rock. Plants reddish with cream flowers (Nicolson 2660, BM, KATH)*; Beding, 27°55′ N, 86°21′ E, alt. 3600 m. Rochers. Fleurs roses (Zimmermann 1405, BM)*; loc. cit., alt. 12000–13000 ft. Flowers white (Dhwoj 269, BM)*; Bhut Pokhni, alt. 16000–17000 ft. Flowers white and pink (Dhwoj 476, BM)*; Dudk Kosi valley, Khumbu below Namche Bazar, alt. ca. 10000 ft. On wet rocks (Horsfall 68, BM)*; Thale–Thale Bisauna, alt. 2600 m. On rock. Flowers white. Anthers red. Ovaries white. Glands yellowish (Kanai, Chuma & Nagano 672808, TI)*; Gopte–Thale Patil, alt. 3300 m. On rock surface. Flowers white (Kanai, Hara & Ohba 726008, TI)*; Gotiora, Gosainkund, alt. 3280 m. On rock in open place. Petals white, sometimes red margined, anthers dark red (Kanai & Malla 674779, TI)*; Tinjure–Tinjure Phedi, alt. 2900 m. On rocks (Kanai, Ohashi, Iwatsuki, Ohba, & Shakya 726007, TI)*; Singum Gompa–Gosainkund, alt. 3600 m. On rocks. Flowers white (Kanai, Hara & Ohba 726014, TI).

This species is clearly distinguished from its closest ally, *Sedum ovatisepalum* (R.-Hamet) H. Ohba, by narrower leaves (very narrowly obovate or linear-obovate with more or less deeply lobulate above a third or nearly entire margin), paucif-lorous inflorescences, longer calyx and petals, etc. Geographically *S. linearifolim* ranges from Kashmir to Nepal while *S. ovatisepalum* ranges from Nepal to N. W. Burma through Sikkim, S. Tibet and Bhutan. These two species occur in central and eastern Nepal where no intermediate plant has been found.

S. linearifolium is considerably variable in both vegetative and floral characters. From western Himalaya Edgeworth (1846) validly published three species, i.e. *S. pauciflorum*, *S. mucronatum* and Royle's *S. sinuatum*. Hooker and Thomson (1858) published Wallich's *S. trifidum* with description and an earlier name as synonym, i.e. *S. sinuatum* Royle ex Edgew. *S. mucronatum* was reduced to a synonym of *S. paucifolium* by Hooker and Thomson. R.-Hamet (1926) considered all of these species to be conspecific with *S. linearifolium* Royle. Examining authentic specimens of these species, I came to the same conclusion except for the treatment of *S. sinuatum*. R.-Hamet has recognized *S. sinuatum* as a variety, but I consider the species indistinguishable from *S. linearifolim* even as a variety.

During my field study in E. and C. Nepal, I came across a plant resembling *S. linearifolium*. The plant is very small (5–10 cm high) and has relatively large flowers. Specimens which exactly agree with this plant have been obtained from several localities in C. and E. Nepal and are cited above with an asterisk. As compared with *S. linearifolium*, s. str. the plant differs as follows:

Flowering stem 5–15 from each apex of rhizome, 5–10 cm long, about 0.3–0.6 mm thick. Leaves linear to very narrowly oblong or very narrowly elliptic or rarely ovate, entire or nearly entire along the margin, 0.5–1.3 × 0.08–0.15 cm in size, emamillate. Inflorescence simple corymb, peduncles nearly 0–3 mm long, pediels 0–1.2 mm long. Calyx 4.5–5.5 mm long, the lobes narrowly triangular-ovate, 4–5 × 0.9–1.3 mm in size. Petals narrowly elliptic to elliptic, 5–7.5 × 1.7–2 mm in size. Stamens 4.2–4.7 mm long, anthers about 0.5 mm long. Gynoecium 5–6 mm long .... *Sedum* aff. *linearifolium*

Flowering stem 1–5, 15–30 cm long 0.8–2.7 mm thick. Leaves very narrowly obovate to linear-obovate, more or less lobulate at the upper a third of the margin or nearly entire, 1–3.5×0.15–2 cm, sparsely to moderately mamillate above. Inflorescence simple corymb-fascicles, peduncles 6–12 mm long, pedicels 3–6 mm long. Calyx 3–5.5 mm long, the lobes usually ovate to narrowly triangular-ovate, 2–3.3×1–2.5 mm. Petals narrowly ovate to ovate or elliptic, 6–12×2–4 mm. Stamens 5–6.5 mm long, anthers 0.8–1.2 mm long. Gynoecium 5–10 mm long .... *S. linearifolium*, s. str.

The plant collected also resembles *S. fastigiatum*, but quite differs from the species in having hermaphrodite flowers, larger calyx, shorter gynoecium and lacking remains of the former year's flowering stems. This is described as follows:

A perennial herb, up to 10 cm high. Rhizome dauciformed or slender, usually 3–10 mm thick, sparsely banched, the epigaeous part usually 1–2.5 cm long, sometimes accrescent more and branched, usually erect or ascending, the apical part crowned by scaly leaves. Scaly leaves deciduous, linear-triangular to narrowly triangular-ovate, acute at the apex, entire along the margin, blackish brown to chestnut-brown, 1.7–2.5 mm long 1.2–1.8 mm wide. Flowering stems 5–15 from each of the apex of rhizome, more or less fastigiate, usually 5–10 cm long, simple, terete, glabrous, nearly smooth to sparsely mamillate (the mamilla pellucid about 0.1 mm long), green or pale green, about 0.3–0.6 mm thick, the old flowering stem not persistent. Leaves alternate, densely arranged throughout, widely spreading, sessile, spurless or often very slightly spurred (about 0.3 mm), thick herbaceous, very slightly convex or flattish, green or pale green or yellowish green, linear to very narrowly oblong (SADT n. 13) or very narrowly elliptic (SADT n. 1) or linear-ovate, acute above with round or obtuse apex, entire or nearly entire but under a lens (×40) usually minutely mamillate along the upper half of margin (the mamilla pellucid about 0.05 mm long), (5–)6–12 (–13) mm long 0.8–1.5 mm wide, 6.3–9.5 times longer than broad, glabrous and rather smooth on both surfaces, the costa not prominent, the lateral veins 1–3 on each side of the costa, nearly parallel to the costa, not reaching the margin. Inflorescence terminal, 1–3(–5)-flowered, bracteate, usually forming a simple-corymb; peduncles nearly 0–3 mm long, usually minutely mamillate (the mamilla about 0.05 mm long); bracts leafy, very similar to the upper cauline leaves in shape but smaller, usually 3–5 mm long 0.5–1 mm wide; pedicels 0–1.2 mm long, usually minutely mamillate. Flowers in middle August to late September, hermaphrodite, mostly 5-merous, 6–10 mm wide at anthesis, the alabastrum reddish. Calyx 4.5–5.5 mm long, usually equalling 4/5 of the petals in length, green, glabrous, the tube usually less than 0.5 mm long; the lobes 4–5 mm long 0.9–1.3 mm wide, narrowly triangular-ovate, entire along the margin, convex in the lower and concave in the upper half of the margin, gibbous outside and hollowed inside in the lower half, slightly round outside and slightly concave or flattish inside, round or obtuse at the apex, sometimes tinged with red near the apex and/or along the margin. Petals distinct, white or often reddish near the apex, somewhat fleshy, glabrous, spreading at anthesis, usually narrowly elliptic (SADT n. 2) to elliptic (SADT n. 3), acute or acuminate in the apical part, obtuse and often minutely mucronulate at the apex, boat-shaped, entire along the margin, 5–7.5 mm long

1.7–2 mm wide. Stamens distinctly shorter than the petal, ascending or erect at anthesis; filaments subulate, somewhat fleshy, obcompressed, glabrous, white, 0.3–0.4 mm wide at the base, the epipetalous ones inserted usually 1–2 mm from the base, and 3–3.5 mm long, the alternipetalous ones 4.2–4.7 mm long; anthers basifixed, ellipsoidal, round or shallowly retuse at the apex, usually about 0.5 mm long, before anthesis purplish red, after dehiscence yellow. Nectar-scales broadly oblong to square, but irregularly and minutely retuse at the apex, often slightly convex on the lateral side, 0.6–1 mm long 0.7–1.2 mm wide about 0.2 mm thick, mostly pale yellow. Gynoecium 5–6 mm long, white, usually 0.7–0.8 mm connate ventrally from the base, sessile, erect, the ovaries not gibbous ventrally, 3.5–3.7 mm long 1.1–1.3 mm wide, usually gradually tapering upwards from the middle dorsally, the style often slightly outcurved, about 1.5 mm long, the stigma epapillate, the placenta nearly marginal. Ovules 12–18 in each loculus, mostly descending, ellipsoidal with round apex, 0.5–0.7 mm long, the funicles less than 0.3 mm long.

Sedum ovatisepalum (R.-Hamet) H. Ohba, stat. nov. [Fig. 48a-e]

Sedum linearifolium Royle var. *ovatisepalum* R.-Hamet in Act. Hort. Gothob. **2**: 394 (1926)–Fröd. in Act. Hort. Gothob. **5**: append. 52, fig. 189–192 (1930)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18a**: 442 (1930)–Hara, Fl. E. Himal. 107 (1966).

Sedum trifidum Wall. ex Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 100 (1858), nom. illegit., pro minore parte, excl. pl. ex Simla et excl. syn. cit.–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 420 (1878), pro parte, excl. syn. cit.–Masters in Gard. Chron. new ser. **10**: 267 (1878), pro parte–W. W. Smith et Cave in Rec. Bot. Surv. Ind. **4**: 197 (1911)–W. W. Smith in Rec. Bot. Surv. Ind. **4**: 372 (1913)–Praeger in Journ. Roy. Hort. Soc. **46**: 63, fig. 25, 26 (1921), pro major parte; in Not. Bot. Gard. Edinb. **13**: 96 (1921), excl. specim. cit.

Sedum linearifolium Royle sensu Weibel in Candollea **16**: 144 (1958), pro parte.

Rhodiola ovatisepala (R.-Hamet) Fu in Act. Phytotax. Sin. Addit. **1**: 127 (1965).

Sedum sinuatum Royle ex Edgew. var. *ovatisepalum* (R.-Hamet) H. Ohba in sched.

A perennial herb, usually 5–20(–25) cm high. Rhizomes slender, the hypogaeous part creeping, up to 20 cm long, 2–5 mm thick, sparsely branched, often surculos, the epigaeous part usually 1–2 cm long 3–5 mm thick, but sometimes accrescent more, ascending or erect, the apical part crowned by scaly leaves. Scaly leaves chartaceous, rather caducous, triangular or triangular-ovate to shallowly triangular-ovate with entire margin, acute or obtuse at the apex, 1.5–3(–5) mm long 1–3 (–4) mm wide, blackish brown to chestnut-brown. Flowering stems (1–)2–4(–5) in each apex of rhizome, annual, usually 5–20(–25) cm long, ascending or suberect, simple, terete, glabrous and rather laevis, pale yellowish green, (0.8–)1–2.7(–3) mm thick, the dead stem hardly persistent. Leaves alternate, aggregated on the upper 1/4–1/3 part of stem, widely spreading, mostly sessile, spurless, thick herbaceous, flattish, yellowish green, ovate to oblong-obovate and more or less imparilobulate or sinuolate upper half of the margin, (1–)1.5–7(–8) cm long, 0.2–2(–2.3) cm wide, densely papillate or mamillate along the margin (the papilla or mamilla less than 0.1 mm long), glabrous, but sparsely or moderately mamillate above (the mamilla less than 0.05 mm high), laevis beneath, obtuse to round at the apex, mostly very long-attenuate at the base; the lobes (0–)3–7(–9) in number, narrowly triangular-ovate to distorted linear-ovate or narrowly triangular, usually spreading, (1.5–)2–10(–12) mm long 0.8–5(–6) mm wide, obliquely obtuse or round at the apex, entire to shallowly and very remotely sinuolate along the margin; the sinus between the lobes usually acute or often obtuse with round or obtuse apex; the costa slightly caved under the upper surface, the veins obscure, the lateral-veins 3–5 on each side of the costa. Inflorescences terminal, usually 20–40-flowered, bracteate, forming a more or less flaccid compound-dichasium or rarely dichasium-fascicles; the cluster 3(–4) in number, 1–5(–7.5) cm long, with (1–)3–7(–9) dichasia, sometimes having secondary axis with 1–3 dichasia or monochasia; peduncles 3–6 mm long, terete, glabrous, mostly laevis; pedicels 4–10 mm long, glabrous but often very sparsely papillate (the papilla about 0.1 mm long); bracts linear-obovate or linear-ovate, 5–17 mm long 2–5 mm wide, sessile, round or obtuse at the apex, long-attenuate at the base, nearly entire but densely papillate or mamilate along the margin (the papilla or mamilla less than 0.1 mm long), both surfaces glabrous but sparsely papillate above. Flowers in late July to middle September, hermaphrodite, mostly 5-merous, 8–18 mm wide at anthesis. Calyx 1.7–2.5(–3.5) mm long, yellowish green, the tube usually 0.5–1.2 mm long, glabrous and mostly epapillate, the lobes 1.5–2.5 mm long 1.3–1.5 mm wide, usually ovate, entire along the margin, round at the apex, round outside and flattish or rarely concaved inside, usually 0.4 mm thick near the base, often reddish at the tip and/or along the margin. Petals spreading at anthesis, distinct, very narrowly oblong-ovate, (5.5–)6.2–7.5 mm long 1.1–1.3 mm wide, entire along the margin, nearly parallel in the lower half, round or obtuse and always mucronulate at the apex (the mucro 0.2–0.3 mm long with round apex), mostly milky white inside, pale greenish white or often slightly tinged with red outside, both surfaces glabrous and laevis, in the upper 2/3 part round and slightly keeled outside and concave or flattish inside, but in the lower 1/3 part flattish. Stamens slightly shorter or longer than the petal, ascending at anthesis; filaments linear-filiform but slightly tapering above, obcompressed, glabrous, whitish, about 0.4 mm wide at the base, the epipetalous ones inserted usually 1.3–1.5 mm from the base, 3.5–4.5 mm long, the alternipetalous ones very shortly (about 0.3 mm) united with the petals, 5–6.5 mm long; anthers basifixed, ellipsoidal, usually shallowly retuse at the apex, mostly 0.8–1.2 mm long, before anthesis deep red-purple, after dehiscence gradually tinged with deep yellow. Nectar-scales rectangular, shallowly emarginate or obtusely truncate at the apex, round outside and concave inside, 0.5–0.7 mm long 0.4–0.6 mm wide, about 0.2 mm thick, deep to pale yellow. Gynoecia usually 5–7 mm long, white with very slightly greenish shade, usually connected 0.3–0.6 mm from the base ventrally, sessile, erect, the ovary 4–5 mm long 0.7–1.2 mm wide, nearly straight ventrally, gadually tapering upward from the middle dorsally, the style usually 0.8–2 mm long, often slightly outcurved, the stigma epapillate, the placenta nearly marginal. Ovules 8–12(–14) in each locule, descending, ellipsoidal with round or elongate apex, 0.6–0.8 mm long, the funiculus about 0.2 mm long.

Distr. Nepal, Sikkim, S. Tibet, Bhutan, and N. W. Burma.

Specimens examined. Nepal. Jumla–Gargigath, alt. 11000 ft. Growing in moss on tree trunk in evergreen oak and conifer forest. Petals white, filaments white, anthers fawn, styles white (Polunin, Sykes & Williams 5032, BM); Johbesi (27°36′ N, 86°32′ E), alt. 9000 ft. On mossy rocks. Flowers white (Stainton 6555, BM); Ckhintapu (27°06′ N, 87°58′ E), alt. 2900 m. Rochers moussus. Fleurs blanches (Dobremez 1266, BM); Ratamata, Chakare Lekh, alt. 10000 ft. Growing on mossy tree trunks. Flowers white; anthers salmon-coloured (Polunin, Sykes & Williams 398, BM); North of Barse, alt. 12000 ft. Epiphytic on boulders of trees. Flowers white, anthers fawn (Stainton, Sykes & Williams 3852, BM, TI); Pongsing, alt. 15000 ft. (Dhwoj 108, BM); Thama–Thami valley, Khumbu, alt. ca. 12500 ft. In moss on rocks near river (Horsfall 59, BM); Tukucha, Kali Gandaki, alt. 10000 ft. In wood. Petals and filaments white, anthers red (Stainton, Sykes & Williams 7487, BM); Lete, S. of Tukucha, Kali Gandaki, alt. 10500 ft. On rocks in wood. Petals and filaments white, anthers black (Stainton, Sykes & Williams 7907, BM, TI); Bhusenge–Thawrebas, alt. 8000 ft. (Shrestha & Upadlyay 3005, KATH). Sikkim. (Kurz s.n., BO; Thosmson s.n., BO); Chiyabanjyang–Phalut, alt. 3100–

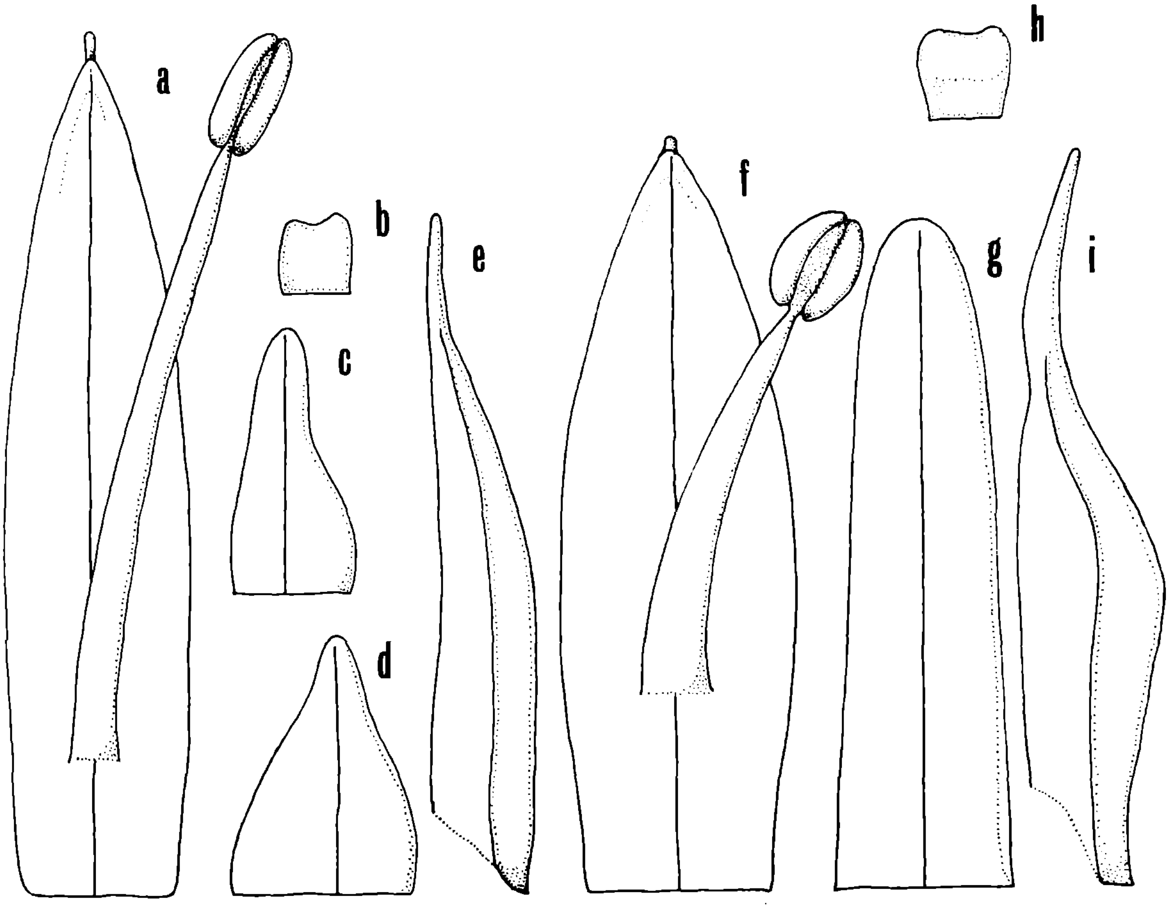

Fig. 48. *Sedum ovatisepalum* (R.-Hamet) H. Ohba (a–e). a. Petal with stamen, b. Nectar-scale in dorsal view, c. and d. Calyx-lobes, e. Pistil in lateral view. *Sedum sacrum* (R.-Hamet) H. Ohba (f–i), f. Petal with stamen, g. Calyx-lobe, h. Nectar-scale in dorsal view, i. Pistil in lateral view, All × 15. (a–e. Kanai et al. 726009, f–i. Kanai, Hara & Ohba 726362. All drawing from the alcoholic material).

3400 m (Hara, Kanai, Murata, Togashi & Tuyama 6660, TI, KYO); Phalut, alt. 3500 m. On tree (H., K., M., T. & T. 6659, TI); loc. cit., alt. 3600 m. On mossy tree trunks. Petals white but often tinged red outside, calyx green (Kanai, Ohashi, Hara, Iwatuski & Ohba 726006; 726009, TI); Phalut–Sabargam, alt. 3400 m. On trees (Hara, Kurosawa & Ohashi 69683, TI); Phalut–Sandakphu. On trees (Hara, Kanai, Murata, Togashi & Tuyama 6661, TI); Sandakphu–Sabargam, alt. 3200–3600 m. On mossy tree trunks. Flowers white, anthers before anthesis muddy red, after dehiscence yellowish (Kanai, Ohashi, Hara, Iwatsuki & Ohba 726003; 726004; 726005, TI); Sandakphu, alt. 3600 m. On rocks. (Hara s.n., TI); loc. cit. On tree trunks (Kanai, Ohashi, Hara, Iwatsuki & Ohba 726002, TI); Sandakphu–Gairibas (Hara s.n., TI); Gairibas–Kala Pokhari. Flowers white (Hara s.n., TI); Kala Pokhari–Sandakphu, alt. 3200 m. On trees or rocks. (Kanai, Ohashi, Hara, Iwatsuki & Ohba 726000, TI); Lechieng, alt. 9000 ft. (Gammie 363, BO). Bhutan. Tzatogang–Dotanang, alt. 3000 m. On rock (Kanai, Murata, Ohashi, Tanaka & Yamazaki 1777, TI). N. W. Burma. Southern Chin Hills, Mt. Victoria region. Subalpine, top-section, alt. 9500 ft. On grassy slopes. (Alsterlund s.n., GB); Mt. Victoria, alt. 10000 ft. On rocks, on the south (grass) slope. The seeds germinate in the capsule (Kingdon-Ward 22427, GB); loc. cit. Summit. Flowers pink (Kingdon-Ward 22810, GB).

This species has often been called *Sedum trifidum* Wall. ex Hook. f. et Thoms., but the name is a superfluous one of *S. sinuatum* Royle ex Edgeworth, because Hooker and Thomson cited the latter species as a synonym of *S. trifidum.*

I was able to observe this species in Singalila range where the species occurs abundantly from 3000 m to 3500 m in altitudes. The species grows with mosses on sedimental or pegmatitic rocks or on branches of living *Rhododendron* spp., etc., and seems to prefer sunny and exposed places. Its leaves are very variable in size but rather uniform.

Sedum sacrum (R.-Hamet) H. Ohba in Journ. Jap. Bot. **49**: 321 (1974). [Fig. 48f–i]

Sedum linearifolium Royle var. *sacrum* R.-Hamet in Act. Hort. Gothob. **2**: 395 (1926)–Fröd. in Act. Hort. Gothob. **5**: append. 53 (1930).

Rhodiola sacra (R.-Hamet) Fu in Act. Phytotax. Sin. Addit. **1**: 127 (1935).

Sedum sacrum Prain in R.-Hamet, loc. cit. 395 (1926), pro syn.

A perennial herb, up to 20 cm high. Root slender or dauciformed, 2–4 mm thick, sparsely branched. Rhizomes thick, usually 1–3 cm long 1.5–2 cm thick, more or less epigaeous, accrescent and branched, ascending or suberect, the base tapering to the root. Rhizomatoclades usually 1–4 in number, fleshy, subcylindrical, solid, usually 2–7 cm long 0.5–1 cm thick, usually dull yellow-orange, mostly epigaeous, erect to ascending, the upper part densely covered with scaly leaves. Scaly leaves chartaceous, caducous, triangular with acute apex, 3–6 mm long 2–4 mm wide, entire and slightly convex along the margin, chestnut-brown to pale rusty. Flowering stems 2–5(–6) from each rhizomatoclade, annual, usually 10–18 cm long, ascending or suberect, simple, terete, glabrous but under a lens (×ca. 40) densely (especially in the upper part) to sparsely papillate (the papilla pellucid, 0.1–0.05 mm long 0.15–0.1 mm in diameter), green, remotely foliferous (12–16-leaved), the internodes usually shorter than the leaf, the old flowering stem more or less (not over a year) or hardly persistent. Leaves alternate, spreading, almost sessile, almost spurless or very slightly spurred (about 0.5 mm long), thick herbaceous, flat, yellowish green, ovate to oblong-ovate or elliptic, (12–)15–25 mm long 7–17 mm wide, 1.4 to 2.8 times longer than breadth, sparsely or moderately papillate above (the papilla pellucid, 0.05–0.1 mm long 0.15–0.1 mm in diameter), glabrous and rather smooth beneath, round at the apex, shortly attenuate or attenuate at the base, crenulate-serrate or minutely lobulate and moreover very densely papillate along the margin, the teeth oblique with round apex, the sinus round or often angulate (the angle 60°–100°), the costa and the veins not prominent, the lateral-veins 3–4 on each side of the costa and not reaching the margin. Inflorescences terminal, 4–12-flowered, bracteate, usually forming a dichasium-fascicle consisting of mostly 3–4 dichasia or occasionally of monochasia or rarely a smaller compound-dichasium, having 3 primary lateral axes (5–10 mm long) with 1–3 dichasia; peduncles 2–5 mm long, densely papillate (the papilla less than 0.1 mm long), terete; bracts 4–9 mm long 1.5–3.5 mm wide, sessile, elliptic with round apex, shortly attenuate at the base, nearly entire or rarely repand along the margin, the upper surface and the margin sparsely or densely papillate (the papilla less than 0.1 mm long), the under surface glabrous and smooth; pedicels 1–2(–3) mm long, nearly terete, mostly very densely papillate. Flowers in late July to August, hermaphrodite, mostly 5-merous, 5–7 mm wide. Calyx 4.8–6 mm long, usually equalling the 2/3 of the petal in length, green, the tube usually 1 mm long, glabrous; the lobes 3.5–5 mm long 1.1–1.4 mm wide, oblong to oblong-ovate, round at the apex, entire along the margin, upper half of the margin densely papillate and the rest nearly epapillate, slightly convex and sparsely papillate outside, nearly flattish and smooth inside, in colour deeper upwards, the papilla less than 0.1 mm long. Petals white and often reddish along the margin, distinct, sessile, somewhat fleshy, glabrous, widely spreading at anthesis, usually narrowly obovate, mucronulate or obtuse at the apex, entire along the margin, round and very slightly keeled outside, concave inside, 5–7 mm long 1.2–2 mm wide. Stamen slightly shorter than the petal or nearly equalling it, ascending at the anthesis; filaments subulate, somewhat fleshy, obcompressed, glabrous, whitish except the red tip, about 0.6 mm wide at the base, the epipetalous ones inserted usually 1.5 mm from the base, 2.8–3.2 mm long, the alternipetalous ones 4.5–5 mm long; anthers basifixed, ovoidal, usually shallowly retuse but very rarely having a very short projection at the apex, mostly 0.8 mm long, before anthesis deep purplish red, after dehiscence gradually tinged with yellow or yellowish green. Nectar-scales ovate-rectangular with emarginate apex, flattish, 0.6–1 mm long 0.5–0.8 mm wide, about 0.2 mm thick, rosy but in the lower central part dark orange. Gynoecia 4.5–6 mm long, white, usually 0.6–0.8(–1) mm connected ventrally at the base, sessile, erect, the ovary straight ventrally, dorsally round and tapering towards the apex from the middle, 3–3.5 mm long, broadest at the middle, 1–1.2 mm wide, the style usually 1.2–1.6 mm long, slightly outcurved or straight, the stigma epapillate, the placenta nearly marginal. Ovules 14–20 in each locule, descending, ellipsoidal with elongate apex, usually 0.5–0.7 mm long, the funiculus 0.2–0.3 mm long.

Distr. Nepal and Tibet.

Specimens examined: Tibet. Kambajong (Prain s.n. in Sept. 1903, CAL–Isotype of *Sedum linearifolium* var. *sacrum* R.-Hamet); Gyangtse (Walton s.n. in 1904, CAL); Gyangtse Hills (Stewart s.n. in Aug. 1907, CAL); without special locality (King's collector 187, CAL; unknown collector 296 in 1884, CAL). Nepal. Marsiandi Valley, alt. 8500 ft. Shady moss covered boulders and cliffs. Flowers white. Leaves fleshy and bright yellow green (Lowndes 1399, BM): Phulchoki, S. Kathmandu, alt. 2600 m (Kanai 673427, TI); loc. cit. On mossy rocks in *Quercus semecarpifolia*-forest. (Ohashi & Ohba 726360, TI); loc. cit. On mossy rocks. Flowers white (Hara, Iwatsuki, Ohba & Iwatsuki 726361, TI); Singum Gompa, alt. 3000 m (Hara, Kanai, Kurosawa & Ohashi 6358, TI); loc. cit. On rock surface. Calyx pale green, petals somewhat boat-shaped, white but margin above half reddish, anthers and the tip of filaments dark red purple, ovary white, gland dark orange (Kanai, Hara & Ohba 726362, TI); North west of Gurjakhani, alt. 10750 ft. On rocks in *Quercus* forest. Flowers whitish (Stainton, Sykes & Williams 3683, BM, TI); Below Garjigoth, Dori Lekh, W. of Jumla, alt. 10000 ft. Growing in moss on rock beside stream. Leaves pale green beneath. Sepals pale green. Petals white. Filaments white, anthers pale green. Ovaries white (Polunin, Sykes & Williams 5049, BM, TI); On way to Bumra, alt. 8–9000 ft. On shady and rocky places. Fls. small and green (Malla 10708, BM).

Sedum sacrum closely resembles *S. ovatisepalum* (R.-Hamet) H. Ohba, but is distinguishable from the latter species by the leaf arrangement, calyx-lobes and petals; the leaves scattered throughout the stem in *S. sacrum* while more or less aggregate in *S. ovatisepalum*; calyx-lobes oblong to oblong-ovate, 3.5–5 × 1.1–1.4 mm in size and papillate against ovate, 1.5–2.5 × 1.3–1.5 mm and epapillate; petals usually narrowly obovate and 5–7 × 1.2–2 mm in size against very narrowly oblong-ovate and 5.5–7.5 × 1.1–1.3 mm.

Subsect. **Chamaerhodiola** (A. Schrenk) H. Ohba, stat. nov.

Rhodiola sect. Chamaerhodiola A. Schrenk, Enum. Pl. Nov. **1**: 69 (1841).

Sect. Rhodiola ser. Rhodiolae group. 2 Himalenses Praeger in Journ. Roy. Hort. Soc. **46**: 27 (1921).

Sect. Rhodiola subsect. Eurhodiola § 2. Himalensia (Praeg.) Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930), excl. *S. Smithii* et *S. gelidum*.

Sect. Rhodiola group 2. Chamae-Rhodiola (A. Schrenk) Fröd. in Act. Hort. Gothob. **5**: append. 26 (1930), excl. *S. gelidum*, *S. algidum* et *S. crassipes*; **15**: 3 (1942), ut Chamae-Rhodiola (Fisch. et Mey.).

Chamaerhodiola (A. Schrenk) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 27 (1934), pro parte.

Rhizomes protected by the former years' dead flowering stems forming a tuft. Annotinous flowering stems numerous, usually more than 6 in number.

Type species: *Sedum quadrifidum* Pallas.

This subsection is highly differentiated in the Himalayan regions and also in

N. W. China.

Sedum quadrifidum Pallas, Reise **3**: 730, t. 6, fig. 1 (1776)–Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 97 (1858), cum var. α, β, γ. *scoparium*, δ. *coccineum* (Royle) et ε. *acuminatum*–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 418 (1878)–Maxim. in Bull. Acad. Sci. St.-Pétersb. **29**: 125 (1883)–Hemsley in Journ. Linn. Soc. Bot. **35**: 177 (1902)–W. W. Smith et Cave in Rec. Bot. Surv. Ind. **4**: 197 (1911), pro parte–W. W. Smith in Rec. Bot. Surv. Ind. **4**: 259 (1911) et 371 (1913), pro parte–Praeger in Journ. Roy. Hort. Soc. **46**: 51 (1921)–Limpricht in Fedde, Repert. Beih. **12**: 392 (1922)–Fröd. in Act. Hort. Gothob. **1**: 26 (1924); **5**: append. 28 (1930), pro parte, excl. var. et Pl. 2-1; in Hand.-Mzt., Symb. Sin. **7**: 405 (1931); in Bull. Fan Mem. Inst. Biol. Bot. **7**: 11 (1935); in Act. Hort. Gothob. **15**: 3 (1942) et in Ark. Bot. **30**A(9): 2 (1943)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930)–Baehni, Bonner et Vautier in Candollea **13**: 227 (1951), verisim. [Fig. 49]

Rhodiola asiatica D. Don, Prodr. Fl. Nepal. 213 (1825).

Sedum asiaticum (Don) DC., Prodr. **3**: 401 (1828)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 419 (1878), pro parte. Fide Fröd. in Act. Hort. Gothob. **5**: append. 30 (1930), in nota *S. quadrifidum* et in Hand.-Mzt. Symb. Sin. **7**: 407 (1931), in nota *S. crassipes*.

Sedum coccineum Royle, Ill. Bot. Himal. 223, t. 48, fig. 3 (1835).

Rhodiola quadrifida (Pallas) Fischer et Meyer in Schrenk, Enum. Pl. Nov. **1**: 69 (1841)–A. Boriss. in Kamarov, Fl. USSR **9**: 39 (1939)–Webb in Fl. Europ. **1**: 363 (1964).

Sedum quadrifidum Pallas var. *coccineum* (Royle) Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 97 (1858).

Sedum scabridum Franchet sensu Praeger in Not. Bot. Gard. Edinb. **13**: 94 (1921).

Chamaerhodiola quadrifida (Pallas) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 29 (1934).

Chamaerhodiola asiatica (D. Don) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 29 (1934).

Rhodiola coccinea (Royle) A. Boriss. in Komarov, Fl. USSR **9**: 41 (1939).

A perennial cushion plant, usually less than 5 cm high in the aerial parts. Rhizomes thick, stout or elongate, nearly obconical or nearly cylindrical, solid, the base continuously tapering to the dauciformed or long and slender roots (up to 20 cm long), conspicuously or well branched; the rhizomatoclades densely protected by the remains of the former years' flowering stem, usually 0.5–8 cm long 1–3 cm across including the former years' old flowering stem, more or less accrescent towards the apex, usually dark brownish, the apical part more or less epigaeous, densely scaly. Scaly leaves chartaceous, more or less persistent, usually narrowly triangular, narrowly ovate (SADT n. 37), narrowly triangular-ovate or triangular-ovate, acute or obtuse at the apex, entire along the margin, 4–8 mm long, 1.5–4 mm wide, ferrugineous in the beginning, chestnut- or blackish brown later. Flowering stems 2–10 in number, nearly erect, simple, nearly terete, glabrous, emamillate to moderately mamillate (the mamilla about 0.05 mm long), usually 1–5 cm long, about 1 mm thick at anthesis, slightly accrescent later, remaining over

3 or 4 years, the remains more or less wiry, suberect or ascending, somewhat incurved, umber or pale dirty brown. Leaves alternate, arranged throughout, spreading widely, sessile, spurless or very slightly spurred (about 0.1 mm long, round), thick herbaceous, flat, usually linear or linear-elliptic, usually 3–7 mm long, 0.6–0.8 mm wide, round or obtuse at the apex, entire but often mamillate (the mamilla less than 0.1 mm long) along the margin, attenuate or shortly attenuate at the base, glabrous, nearly emamillate, the costa not prominent, the lateral veins usually 2–4 on each side of costa, nearly parallel, not reaching the margin. Inflorescences usually reduced to a single terminal flower, but rarely consisting of a dichasium, very shortly pedicelate (pedicels less than 2 mm long), bracteate or ebracteate, bracts relatively a few, very similar to the cauline leaves. Flowers dioecious, in late June to August, mostly 4-merous but rarely 3- or 5-meous, 3–4 mm across at anthesis. Calyx 2.5–3.5 mm long, glabrous; the tube funnel-shaped, green, 0.6–1.2 mm long; the lobes 0.75–1.1 times longer than the petals, 1.4–2.5 mm long 0.5–1.2 mm wide, usually linear-ovate or very narrowly triangular (SADT n. 73), round or obtuse at the apex, entire along the margin, suberect or ascending at anthesis, somewhat round outside, flattish inside, green but often reddish; the sinus between lobes usually obtuse (♂) or truncate or round (♀). Petals distinct, red or yellow, usually oblong-elliptic or ovate, 2.5–3.5 mm long 0.8–1.7 mm wide, entire along the margin, round or obtuse at the apex, glabrous, spreading (♂) or suberect to spreading (♀) at anthesis, shallowly boat-shaped. Stamens slightly (about 1.2 times) longer than the petal, ascending or suberect at anthesis; filaments linear-filiform, somewhat fleshy, obcompressed, glabrous, about 0.3 mm wide at the base, the epipetalous ones inserted 0.5–1.2 mm from the base, 1.7–2.5 mm long, the alternipetalous ones 3–4 mm long; anthers basifixed, ellipsoidal or ovoidal, usually 0.5 mm long, slightly retuse at the apex, before anthesis red, after dehiscence turning yellow. Nectar-scales usually narrowly oblong or narrowly oblong-triangular, round and usually very shallowly retuse at the apex, more or less adherent to the ovary, yellow, 0.6–1.3 mm long 0.3–0.5 mm wide, about 0.2 mm thick. Gynoecium of female plants 4–6 mm long, usually 1.5–2 times longer than the petal, connected ventrally about 1.5 mm from the base, sessile, erect, pale reddish, the connected part adnate to the calyx-tube dorsally, the ovary not gibbous ventrally, opposite to the calyx-lobe and nectar-scale, usually widest at the lower 1/3 part, 1–1.5 mm wide, and abruptly narrowing and outcurved in the upper part, the style indistinct, the stigma epapillate, the placenta nearly marginal. Gynoecia of male plants 2–3.5 mm long, usually shorter than the petal, connected usually 0.5–1 mm ventrally, tapering from the middle to the apex dorsally, nearly straight ventrally, having a short style. Ovules of female plants mostly 6 in each locule, usually descending, ellipsoidal, round

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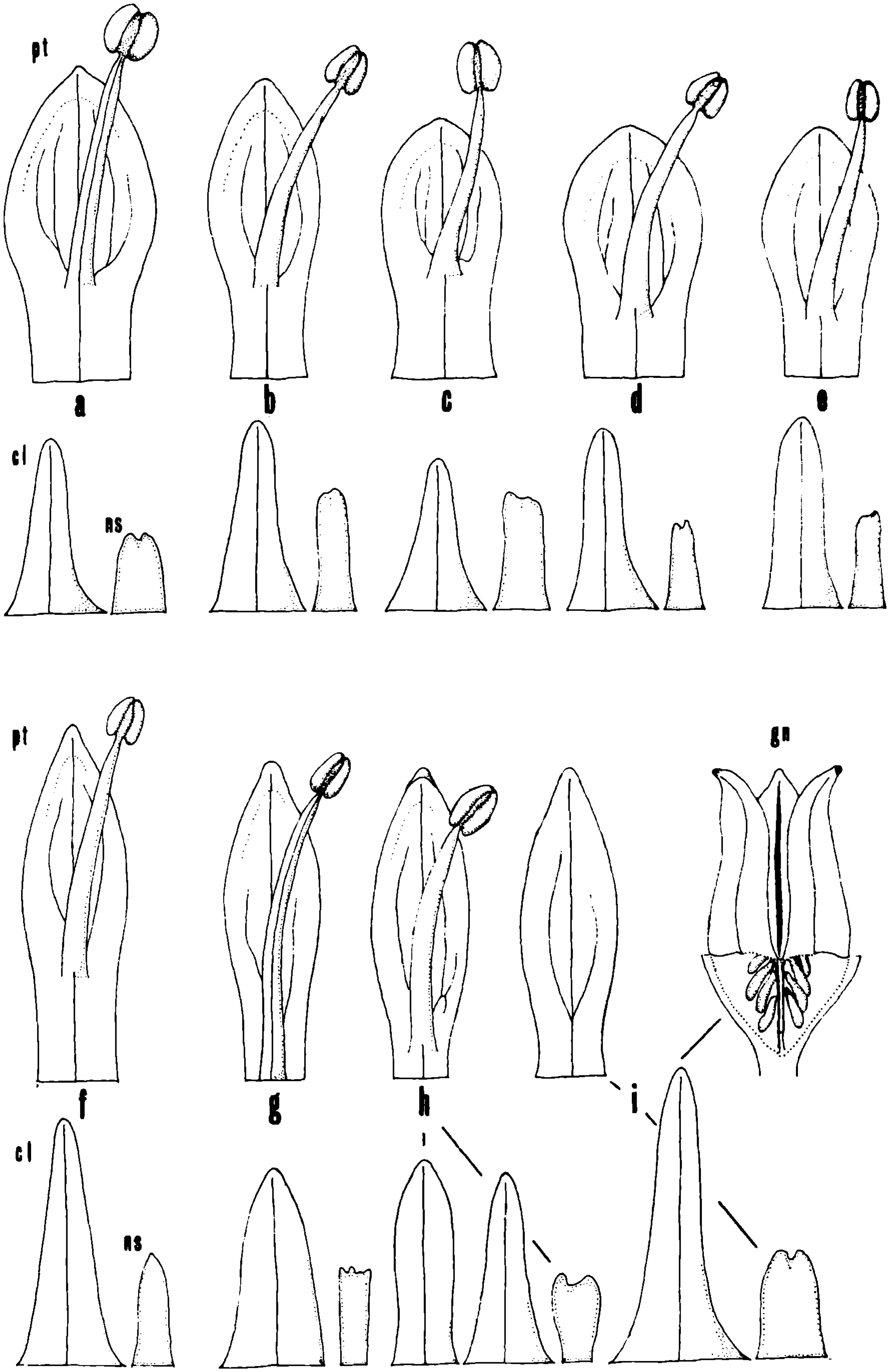
Fig. 49. *Sedum quadrifidum* Pallas, showing variations of petals (pt), calyx-lobes (cl) and nectar-scales (ns), all ×15, and pistils in longitudinal section (gn), ×7.5. a. Stainton, Sykes & Williams 1308, b. Gardner 639, c. Williams 2356, d & e. Stainton, Sykes & Williams 3103, f. Barclay & Synge 2636, g. Duthie 13240, h. Duthie 11009, i. Kanai, Hara & Ohba 726354.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at the apex, usually 0.6–0.7 mm long, the funicles less than 0.1 mm long; ovules of male plants mostly 2 but often 3 or 4 in each locule, 0.3–0.5 mm long, probably abortive. Follicles 6–7 mm long, erect, reddish brown. Seeds bright brown, usually 1.6–1.8 mm long, ellipsoidal, round at the apex.

Distr. Central Asia, Kashmir, Kumaon, Nepal, Sikkim, Tibet, N. W. China, Mongolia, Siberia and Eurasian Arctic Circle.

Specimens examined from the Himalayan region. N. W. India. (Herb. Royle s.n., LE–Type collection of *Sedum coccineum* Royle). Kashmir. (Herb. Falconer 475, LE); Kajnag range, alt. 12–13000 ft. (Duthie 11009, BM); above Gulmarg, alt. 11–12000 ft. (Duthie 11345, LE); Musjid Valley, alt. 13–14000 ft. (Duthie 13240 BM). Kumaon. Rhudugheru, Tehri Garhwal, alt. 15–16000 ft. (Duthie 875, CAL); Pathar Kori, Garhwal, alt. 10500 ft. (Strachey & Winterbottom 19, LE). Nepal. Saipal, alt. 15500 ft. Rock crevices (Arnold 120, BM); Bhurchula Lekh, near Jumla, alt. 12500 ft. In rock crevices. Petals, filament & styles red; anthers black (Polunin, Sykes & Williams 4522, BM); loc. cit., alt. 13000 ft. Growing from rock ledges and crevices. Inflorescence red (Polunin, Sykes & Williams 4683, BM); Chaurkot, S. E. of Jumla, alt. 10000 ft. Growing from shady rock crevices (Polunin, Sykes & Williams 5430B, BM)*; loc. cit. (Polunin, Sykes & Williams 5430, BM); near Dojam Khola, Suli Gad, alt. 15000 ft. Among cliffs. Flowers pinkish red including stamens (Polunin, Sykes & Williams 2278, BM, KATH, TI); loc. cit. Forming clumps on rock faces. Flowers yellow (Polunin, Sykes & Williams 2287, BM, KATH)*; Ya-la, Lantang Valley, alt. 3600 m (Maire 247, BM); Langsisa Kharka, alt. 15500 ft. Flowers reddish brown (Polunin 379, BM); Jargeng Khola, alt. 16000 ft. Bare scree. Flowers yellow (Lowndes 1110, BM)*; "Hidden Valley", N. of Tukucha, Kali Gandaki, 83°35′ E, 28°48′ N, alt. 16–17000 ft. In grass in old moraines. Flowers yellow (Albury & Smith 16, BM)*; Thinigaon, Muktinath Himal, alt. 15500 ft. On scree slopes. Inflorescence yellow (Stainton, Sykes & Williams 1308, BM, KATH)*; Namdo, N. of Mustang, alt. 17000 ft. Open stony slopes (Stainton, Sykes & Williams 2359, BM, KATH)*; Gosainkund, alt. 4200 m. Among rock crevices. Follicles reddish brown (Kanai, Hara & Ohba 726354, TI); N. West of Gurjakani, alt. 14800 ft. Among rocks and bare earth. Flowers yellow-green (Stainton, Sykes & Williams 3103, BM, KATH)*; Balangra Pass, alt. ca. 15000 ft. On peaty slopes. Petals white, sepals reddish (Polunin, Sykes & Williams 1038, BM, KATH)*; Near Seng Khola, alt. 15000 ft. Among short grass. Flowers pink (Stainton, Sykes & Williams 3238, BM); Mukdem Khola, Ghharkabkot, alt. 19000 ft. Growing on consolidated scree and compact peaty turf. Petals pink; calyx reddish (Polunin, Sykes & Williams 1187, BM, KATH); Tilicho Pass path, alt. 16200 ft. On steep yak pastures. Flowers small, yellow (Barclay & Synge 2636, K); Basia Bhanjygang, alt. ca. 18500 ft. On peaty slopes. Plant forming a compact cushions (Polunin, Sykes & Williams 53, BM); KATH)*; near Gangla Bhanjyang, alt. 15500 ft. On fairly recently formed rather bare scree. Flowers yellow (lemon yellow) (Polunin, Sykes & Williams 2356, BM, KATH)*; Sringi Himal, Shiar Khola, alt. 17000 ft. Steep rocky hillside. Flowers yellow (Gardner 640 & 641, BM)*; Rolwaling, 27°55′ N, 86°23′ E, alt. 15500 ft. On old moraine. Flowers red (Stainton 4727A, BM); Dudh Kosi, Pujyah, 27° 39′

N, 86° 43′ E, alt. 14700 ft. On rocks in exposed positions. Flowers deep red (Bowes Lyon 2085, BM); Lumbasamba alp. 87°37′ E, 27° 45′ N (Smith 79, BM); Arun-Tamur watershed, Thagla Bhangjyang, N. of Topke Gola, alt. 15000 ft. Amongst rocks. Inflorescence pink (Stainton 994, BM). Sikkim. regio. alt. 16–18000 ped. (Hooker 20, CAL); Yeumtso La, alt. 14500 ft. (Hooker 186, except the plant at the right, CAL); Chamnago alt. 14000 ft. Flowers yellowish (Smith 3785, CAL); Nathui La, alt. 14000 ft. (Smith 3471, CAL); loc. cit., alt. 15000 ft. (Smith 3458, CAL); Sherabthang, alt. 14000 ft. (Smith 3448, CAL); Chongu, alt. 12–13000 ft. (Smith 3191, CAL); below Kanchunjunga (King's collector s.n., CAL); Ronga, Llonok, alt. 15000 ft. (Smith & Cave 2026, CAL). East Himalaya. Chakalung La, alt. 16000 ft. (Rohmoo Lepcha 341, E).

In the subsect. Chamaerhodiola, this species has the widest range of distribution in the alpine and arctic regions of Eurasia, i.e. from Kashmir through Kumaon, Nepal to Sikkim, Tibet, N. W. China, and Mongolia to the Arctic Circle of Eurasia. The species usually grows in the Himalayas between 4500 m and 5000 m in altitude but sometimes ascends up to 6300 m. The species is very variable in both vegetative and floral characters, as already stated by Hooker f. & Thomson (1858): "Planta variabilis, oujus exemplaria juniora . . . ". The Himalayan plants are often considered as a separate species from the Arctic-Siberian plants. Borissova (1939) excluded the Himalayan regions from the distribution range of *Sedum quadrifidum*. Webb (1964) stated: "The plants from Tibet and Himalaya often cited under this name (*S. quadrifidum*) appear to be different". But he did not clarify any diagnostic features between the two species. As compared with the Himalayan plants, the Arctic-Siberian plants are usually relatively robust, larger in leaves and often conspicuously gemmiferous. In the appearance, these Siberian plants rather resemble *S. fastigiatum*, but in having obovate petals and narrowly oblong nectar-scales they agree with the Himalayan *S. quadrifidum*. On the shape of petals, Pallas (1776) stated that "petala . . . lanceolata", but I could not find a plant having lanceolate petals among specimens from the Arctic-Siberia examined, e.g. Polyarny Ural, Berezovo (Sukachev 130, LE), Irkutsk, Mt. Sayansk (Komarov in 1902, LE), etc.

Hooker & Thomson's description of *S. quadrifidum* somewhat differs from the original one, and is much more accurate for the Himalayan plants. They stated that "floribus 4–5-meris" against "flores quadrifidi" in the original description, "folliculis apice recurvis" against "incapsulas acuminatas", "Flores purpureae, parvae" against "petala . . . flava" and "stamina pleurumque petalis longiora, sed interdum (floribus vere gelatis?) abbreviatis" against "filamentis petala aequiantibus" and added characters on nectar-scales as "glandulis hypogynis subquadratis retusis emarginatis truncatisve". Actually, flowers of the Himalayan plant are not only yellow but red, and often 5-merous. The filaments in the most case are slightly longer than the petals. The Himalayan plants may be separable into two forms as follows:

Flowers yellow. Rhizomatoclades nearly equalling each other in size and age, very densely tufted by the remains of the former years' flowering stems. The remains nearly erect or rarely ascending. ?Cushion plant .... Form 1

Flowers reddish or purplish red. Rhizomatoclades irregular in size and age, relatively densely tufted by the remains of the former years' flowering stems. The remains ascending. Dwarf but not cushion .... Form 2

Specimens asterisked in the citation belong to the Form 1, and the others are the Form 2. It seems uncertain, however, whether these two forms belong to different taxa or not. Therefore, further studies are needed based on ample materials both from Himalaya and from in Arctic-Siberia.

Differences between *S. quadrifidum* and *S. fastigiatum* will be discussed under the note of the latter species.

Sedum fastigiatum Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 98 (1858)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 419 (1878)–Hemsley in Journ. Linn. Soc. Bot. **35**: 177 (1902), versim.–W. W. Smith & Cave in Rec. Bot. Surv. Ind. **4**: 197 (1911)–R.-Hamet in Not. Bot. Gard. Edinb. **24**: 121 (1912)–Praeger in Journ. Roy. Hort. Soc. **46**: 53, fig. 19 (1921); in Not. Bot. Gard. Edinb. **13**: 82 (1921)–Limpricht in Fedde, Repert. Beih. **12**: 392 (1922), versim.–Fröd. in Act. Hort. Gothob. **1**: 26 (1924); in Hand.-Mzt., Symb. Sin. **7**: 405 (1931) et in Ark. Bot. **30**A(9): 2 (1943), versim.–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 140 (1955)–Weibel in Candollea **16**: 144 (1958). [Figs. 50, 51]

Sedum quadrifidum Pallas sensu C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 418 (1878), pro minuta parte–sensu Fröd. in Act. Hort. Gothob. **5**: append. 28 (1930), pro parte–sensu W. W. Smith et Cave in Rec. Bot. Surv. Ind. **4**: 197 (1911), pro parte–W. W. Smith, loc. cit., **4**: 259 (1911) & 371 (1913), pro parte.

Sedum quadrifidum Pallas var. *fastigiatum* (Hook. f. et Thoms.) Fröd. in Act. Hort. Gothob. **5**: append 30, fig. 61–67 (1930), excl. syn. cit.

Chamaerhodiola fastigiata (Hook. f. et Thoms.) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 30 (1934).

Rhodiola coccinea (non Royle) A. Boriss. in Komarov, Fl. USSR **9**: 41 (1939), pro minuta parte et excl. basinonym.

Rhodiola fastigiata (Hook. f. et Thoms.) Fu in Act. Phytotax. Sin. Addit. **1**: 121 (1965)–Acad. Sin. Iconogr. Cormophyt. Sin. **2**: 80, fig. 1889 (1972).

A perennial herb, usually 6–13 cm high. Rhizomes long elongate, nearly cylindrical, accrescent towards the apex, solid, usually 0.5–0.8 mm across in the first year branch or the younger plants, and 2–3 cm across in the well developed plants, up to 15 cm long, sparsely branched, slightly greyish brown or dark reddish brown, usually ascending or suberect, the scar of flowering stem not conspicuous, the base continuously tapering to the root, the upper part epigaeous, densely or sparsely armed with the remains of the former year's flowering stem, the apical part densely covered with scaly leaves. Scaly leaves chartaceous, rather caducous or persistent, triangular-ovate or oblong-ovate or triangular, obtuse at the apex, entire along the margin, ferruginous in the beginning but chestnut- or pale blackish brown in the central part later, 5–10 mm long 3–7 mm wide. Flowering stems (6–)8–15(–20) in number, annual, fastigiate, simple, nearly terete, usually green but rarely reddish, usually sparsely papillate or mamillate (the projection less than 0.1 mm long) or lacking projection, 5–11 cm long, 0.8–2 mm thick, not or slightly

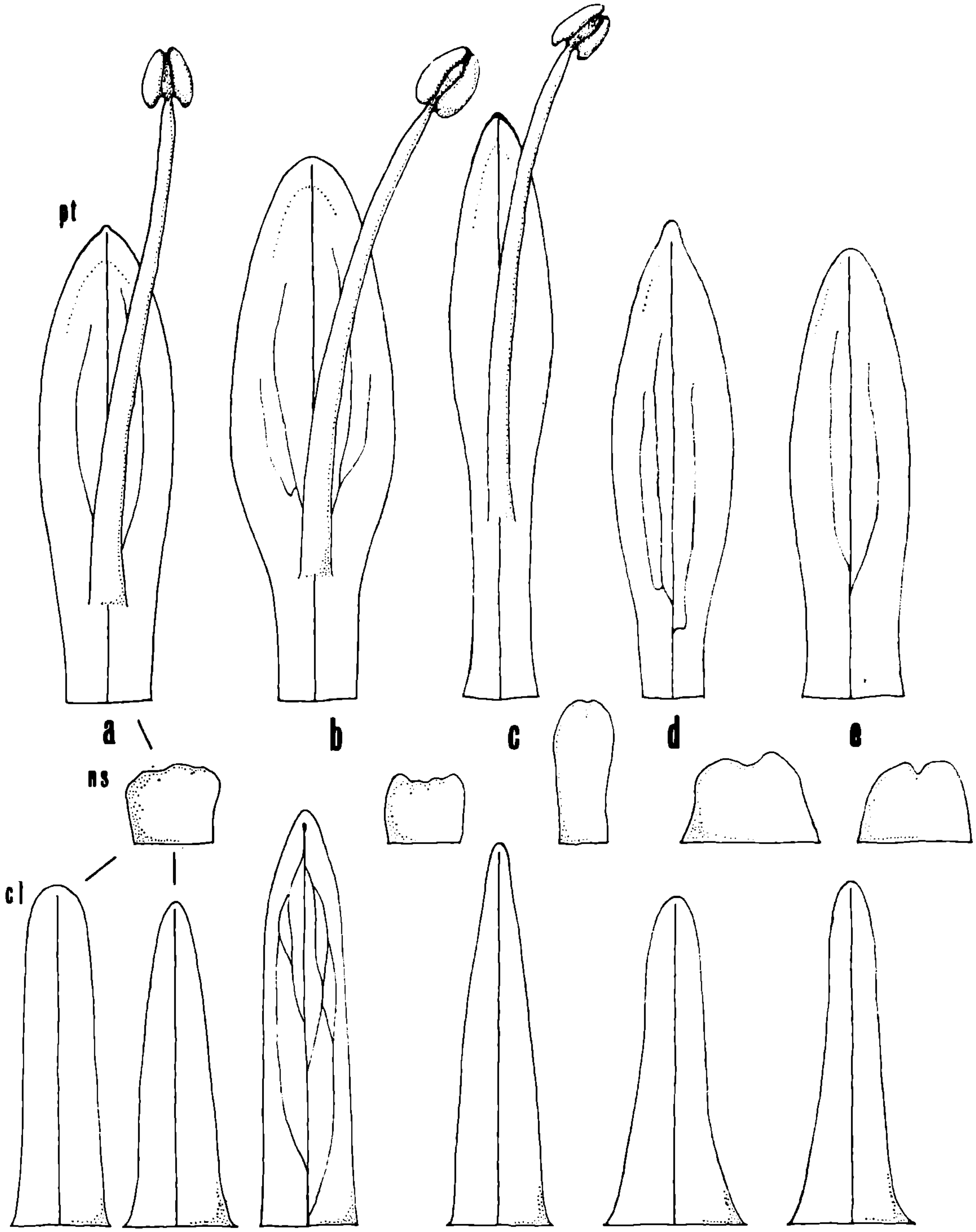

Fig. 50. *Sedum fastigiatum* Hook. f. et Thoms., showing variations of petals (pt), calyx-lobes (cl) and nectar-scales in dorsal view (ns), all ×15. a & e. Mc Cosh 339. b. Polunin, Sykes & Williams 4244. c & d. Hooker s.n.

accrescent later, the remains of the former years' flowering stems usually dark red or stramineous. Leaves alternate, densely arranged throughout, loosely imbricate, spreading widely, sessile, very slightly spurred (the spur 0.3 mm long, round), thick herbaceous, flattish, linear-ovate or linear-obovate or very narrowly ovate (SADT n. 36), usually 8–12 mm long 1.2–1.5 mm wide, usually round but often acutely obtuse at the apex, nearly entire along the margin, attenuate or shortly attenuate at the base, usually light or yellowish green, glabrous, epapillate but often very sparsely to moderately mamillate along the costal part on both surfaces (the mamilla less than 0.1 mm long), the costa usually very shallowly depressed above, not prominent beneath, the lateral veins usually 3–5 on each side of the costa, nearly parallel, usually anastomosing 1 or 2 times. Inflorescences terminal, (4–)6–14(–17)-flowered, bracteate, usually much compact in the male plant, obconoidal, usually 1–1.5 cm (♂) 1.5–2.5 cm (♀) across, forming monochasium-fascicles, the monochasium often lacking the lateral flower; peduncles and pedicels 1–4 mm long, nearly terete, moderately or densely papillate (the papilla pellucid, 0.05–0.15 mm long) or epapillate; bracts few in number, leafy, very similar to the cauline leaves in shape, usually 2–4 mm long 1–1.8 mm wide. Flowers in late June to August, dioecious or often gyno-dioecious, mostly 5-merous, but occaisionally 4-merous, 4–8 mm across at anthesis. Calyx 2.8–3.5(–4) mm long, glabrous, the tube saucer-shaped, green, mostly 0.5 mm long, in female flower more or less rigid; the lobes as long as the 2/3—5/7 of the petal, 2.3–3(–3.5) mm long, 0.6–1.4(–1.8) mm wide at the base, narrowly triangular-ovate or very narrowly ovate (SADT n. 36) or linear-ovate, entire along the margin, round at the apex, somewhat round outside, flattish inside, ascending, more or less adpressed to the ovaries in female plants, green but often reddish; the sinus between lobes obtuse or round in male plants, truncate or round in female plants. Petals distinct, sessile, creamy white or yellow but often reddish outside, usually narrowly elliptic or narrowly obovate or rarely linear-obovate or narrowly oblong, 3.5–6 mm long, (1–)1.3–1.7 mm wide, nearly entire along the margin, round or obtuse and sometimes slightly mucronulate at the apex, in the lower 1/4 of the margin nearly parallel, rather herbaceous, glabrous, ascending (♂) or suberect (♀) at anthesis, in the upper 3/4 part shallowly boat-shaped. Stamens usually slightly longer (about 1.1 times) than the petal, but rarely very slightly shorter, ascending or suberect at anthesis; filaments linear-filiform, flattish, glabrous, creamy white or white but often reddish, about 0.4 mm wide at the base, the epipetalous ones inserted 1–2 mm from the base, 3–4 mm long, the alternipetalous ones 4–6 mm long; anthers basifixed, ellipsoidal or ovoidal, usually 0.4–0.7 mm long, slightly retuse or round at the apex, before anthesis red, after dehiscence turning yellowish. Nectar-scales square or square-ovate, shallowly retuse at the spex, usually flattish, bright or deep yellow, 0.6–0.8 mm long 0.5–0.7 mm wide about 0.2 mm thick. Gynoecium of female plants usually 6–8 mm long (mostly 1.5–2 times of the petal), connected 0.3–0.5 mm ventrally from the base, sessile, erect to suberect, creamy white but often reddish, not gibbous ventrally, dorsally adnate to the calyx-tube, opposite to the calyx-lobe and nectar-scale; ovary usually 1.5 mm wide at the middle, nearly straight ventrally, slightly tapering to the both end dorsally; the style very short, about 1 mm long, slightly outcurved; the stigma rather distinct, very minutely papillate (the papilla less than 0.05 mm long), just below the stigma somewhat swelling and usually dark red; the placenta nearly marginal. Gynoecium of male plants much smaller, usually 1.5–4 mm long, always shorter than the petal and stamen, similar to that of female plants in shape. Ovules of female plants 14–16 in each locule, descending, ellipsoidal, somewhat elongate in the apical part, round at the apex, about 1 mm long, the funicles about 0.1 mm long; ovules of male plants 2–8 in each locule, descending, usually 0.4–0.6 mm long, ellipsoidal, round at the apex, probably mostly abortive but rarely fertile. Follicles 8–10 mm long, suberect, reddish-brown. Seeds reddish or chestnut-brown, narrowly oblong-ellipsoidal with elongate apex, 1.5–2.5 mm long, the testa longitudinally striate minutely.

Distr. Kashmir, Nepal, Sikkim, Tibet, Bhutan, and Yunnan.

Specimens examined. Kashmir. Gurys Pap–Kashmir, alt. 12000 ft. (Winterbottom 494 1/2, K). Nepal. Dolpo, Karang, 29°20′ N, 83°04′ E, alt. 16000 ft. On stony slopes. Flowers white; anthers and calyx red (Stainton 4347, BM, TI); Bhurchula Lekh, near Jumla, alt. 13000 ft. Growing from rock ledges and crevices. Sepals red; petals cream, becoming red; filaments white; anthers brown (Polunin, Sykes & Williams 4682, BM); Dozam Khola, near Sinikot, alt. 12500 ft. Sandy banks beside river. sepals pale green; petals cream; filaments cream; anthers red (Polunin, Sykes & Williams 4244, BM); Thaple Himal, alt. 4900 m (Nakao s.n., KYO); Langtang, alt. 13500 ft. Flowers white (Polunin 223, BM); Lantang Valley, alt. 14000 ft. Scree. Flowers whitish (Polunin 660, BM); Godkje–Surjakund, alt. 4450 m (Malla & Kanai 15098, TI); Gosainkund–Surjakund, alt. 4200 m (Kanai, Hara & Ohba 726355, TI); Mul Kharka, Chilime Khola, alt. 4100 m. Flowers pale yellow white (Kanai & Shakya 672278, TI); Thinigaon, Mukutinath Himal, alt. 15000 ft. Open stony slopes. Calyx & anthers red; petals & filament pale pink (Stainton, Sykes & Williams 1363, BM); Khangsar, alt. 15500 ft. Clumps on tussocks in stony streams. Flowers bright cerise pink (Loundes 1270, BM); near Pudamigaon, alt. 13500 ft. Moist soil near snow in ravines. Flowers whitish; stamens & anthers red (Polunin, Sykes & Williams 2249, BM); Saldanggaon, ca. 4 miles S. W., alt. 18500 ft. On shady scree, forming compact tufts. Petals white; calyx reddish; anthers reddish (Polunin, Sykes & Williams 6, BM); Chumbu, Tsola

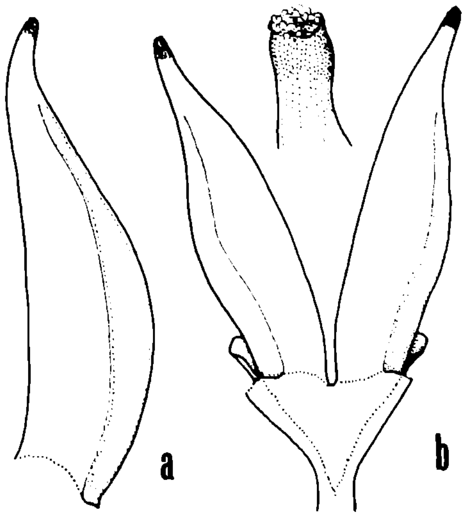

Fig. 51. Pistils of *Sedum fastigiatum* Hook. f. et Thoms., in lateral view, ×7.5. (a. Hooker s.n., b. McCosh 339).

Khola, alt. 15800 ft. In mid streams. Flowers dull red (Bowes-Lyon 2092, BM); Inukhu Khola, ridge of Dudh Kosi, alt. 14700 ft. On rocks. Flowers pale yellow (Bowes-Lyon 2084, BM); Hongu Khola, Mera Mathi, 27°30′ N, 86°45′ E, alt. 16500 ft. On bare shores of alpine tarn. Flowers white (Mc Cosh 339, BM, TI); Chairam, 27°33′ N, 87°58′ E, alt. 13500 ft. Among boulders. Flowers cream (Williams 887, BM); near Sauwala Khola, alt. 12500 ft. Among boulders in ravines. Flowers reddish, petals creamy inside (Stainton, Sykes & Williams 2972, BM, TI); Tukucha, Kali Gandaki, alt. 12000 ft. On open grazing alp. Petals & filaments pinkish white (Stainton, Sykes & Williams 1165, BM); Ganesh Himal, Shiar Khola, alt. 14500 ft. Flowers white–pink–red (Gardner 1350, the above & below left., BM); Rambrong, Lamjung Himal, alt. 13500 ft. On boulders. Sepals reddish; petals cream (Stainton, Sykes & Williams 6105, BM, TI); Choker, alt. 16–18000 ft. Flowers pink white (Dhwoj 389, BM, E); Laurivinayak, alt. 12500 ft. Petals white; calyx green (Malla 9544, BM); Banduke Pokhari, alt. 4200 m. Among rock crevices. Hermaphrodite; petals white; sepals yellow; anthers dark red (Kanai, Ohashi, Iwatsuki, Ohba & Shakya 720399, TI); Saju Pokhari, alt. 4200 m. Among crevices in streams. Flowers creamy white (K.O.I.O. & S. 726356, TI); Jalang Chhyongo, alt. 4300 m. On rock surface. Flowers pinkish white (K.O.I.O. & S. 726349, TI); Kipudonsu–Kipuphu, alt. 4300 m. Flowers white (K.O.I.O. & S. 726351, TI); Kipuphu–Phujeng La, alt. 4500–4800 m. On just thawing moist scree. Flowers reddish (K.O.I.O. & S. 726350, TI). Sikkim. Kankola, (Lama Kangra), alt. 15000 ft. (Hooker s.n. on Aug. 21, 1849, K. (in Herb. Hook.)–Lectotype (♂) and Lectoallotype (♀) of *Sedum fastigiatum* Hook. f. et Thoms.); Oma La–Migotang. (Hara, Kanai, Murata, Togashi & Tuyama 6656, TI); Migotang, alt. 3800 m (H.K.M.T. & T. 6657, TI, KYO). Tibet. (King's collector 117, K, CAL); N. of Sringi Himal, alt. 17500 ft. Petals greenish white, sepals red (Gardner 660, BM); loc. cit. Scree slopes. Petals pinkish white; sepals red (Gardner 661, BM); Sang La, 29° 42′ N, 94°47′ E, alt. 14000 ft. (Ludlow, Sherriff & Taylor 5065, TI); Raj Koti, alt. 15000 ft. (Strachey & Winterbottom 17, K); Rakas Tal, alt. 15000 ft. (Strachey & Winterbottom 17, LE); Chumbi, Phla-ri-tung. Flowers yellowish white (King's collector s.n., CAL); Tokoo La, Chumbi. Flowers yellowish red (Dungboo s.n., CAL); Lonok (Younghusband 219, CAL). Bhutan. Bomtang, Dhur Chu, alt. 15400 ft. On rocks. Flowers greenish yellow (Bowes-Lyon 3408, BM).

This species is very variable in size probably by the influence of the climatic and edaphic conditions as well as difference of age. Especially by age, this species is considerably different, stated by Hooker and Thomson (1858) as general case of the Himalayan *Sedum*: "We have invariably been led to regard the seedling and young specimens as very different species from the old".

Actually this species resembles so closely *Sedum quadrifidum* Pallas, especially when relatively young, that I wonder if it can be really specifically distinct from the latter. Moreover, these two species occur together in altitudes between 4000 m and 6000 m. And I can not find differences between both species except such characters, i.e. the leaves 8–12 × 1.2–1.5 mm in *S. fastigiatum* vs. 3–7 × 0.6–0.8 mm in *S. quadrifidum*; petals 3.5–6 × 1–1.7 mm vs. 2.5–3.5 × 0.8–1.7 mm; gynoecia in female plant 6–8mm vs. 4–6 mm in length. However I tentatively keep *S. fastigiatum* separate from *S. quadrifidum* as a species until further studies are made.

S. fastigiatum resembles *S. scabridum* Franch., *S. nobile* Franch. and its relatives, and the dwarf form of *S. himalense* D. Don. From *S. scabridum*, *S. fastigiatum* is hardly distinguishable except the colour of flowering stem, i.e. dark purplish red against pale green in *S. fastigiatum*. Therefore, these two species may not be specifically distinct. From *S. nobile* and its relatives, i.e. *S. atuntsuense* Praeger, *S. venustum* Praeger, *S. concinnum* Praeger and *S. horridum* Praeger, *S. fastigiatum* slightly differs in shape of leaves and size of flowers. From the dwarf form of *S. himalense*, *S. fastigiatum* is distinguished by papillation and colour of flowering stems i.e. the flowering stem densely papillate and shining purplish red in *S. himalense* while epapillate or sparsely papillate or mamillate and green or rarely pale reddish in *S. fastigiatum*. In altitudes between 4000 m and ca. 5600 m, these three closely related species, i.e. *S. quadrifidum*, *S. fastigiatum* and *S. himalense*, occur together and grow in similar habitat.

In the original description, Hooker and Thomson cited no specimen, but C. B. Clarke cited a single specimen from Kankola, Lama Kangra collected by Hooker. In Herbarium Hookerianum (Kew), there is the specimen cited by Clarke bearing the name '*S. fastigiatum*' in Hooker's own handwriting conserved. The specimen, consisting of both male and female plants, well agrees with the original description, namely "glandulis hypogynis in fl. ♀ quadratis, in fl. ♂ lineari-oblongis". As the very narrowly oblong (i.e. lineari-oblongis) nectar-scales are rather exceptional in *S. fastigiatum*, they apparently described *S. fastigiatum* based on this specimen. Under these circumstances I choose the male plant of this specimen as the lectotype and the female plant as the lectoallotype.

Sedum himalense D. Don, Prodr. Fl. Nepal. 212 (1825)–DC, Prodr. **3**: 402 (1828)–Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 97 (1858)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 418 (1878)–Maxim. in Bull. Acad. Sci. St.-Pétersb. **29**: 131 (1883), in adnota–W. W. Smith et Cave in Rec. Bot. Surv. Ind. **4**: 197 (1911)–W. W. Smith in Rec. Bot. Surv. Ind. **4**: 259 (1911) et 371 (1913)–Praeger in Journ. Roy. Hort. Soc. **46**: 51 (1921), pro parte et excl. fig. 18–Fröd. in Act. Hort. Gothob. **1**: 26 (1924) et in Ark. Bot **30**A(9): 2 (1943)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930)–Kitamura in Kihara, Fauna Fl. Nepal Himal. 140 (1955) ut '*himalaiense*' –Weibel in Candollea **16**: 144 (1958)–Jacobsen, Handb. Succ. Pl., Engl. ed. **2**: 781 (1960), ut '*himalense* Praeg.'–Hara in Spring Fl. Sikkim Himal. 118, fig. 23 (1963); Fl. E. Himal. 107 (1966)–Banerji in Rec. Bot. Sur. Ind. **19**: 45 (1965)–Schilling in Journ. Roy. Hort. Soc. **94**: 230 (1969). [Fig. 52a–i]

Sedum quadrifidum Pallas var. *himalense* (D. Don) Fröd. in Act. Hort. Gothob. **5**: append. 31 (1930).

Chamaerhodiola himalensis (D. Don) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 30 (1934).

Rhodiola himalensis (D. Don) Fu in Act. Phytotax. Sin. Addit. **1**: 121 (1965).

Sedum himalayanum Wall., Cat. no. 7236 (1832), nom. nud.

Sedum hypericifolium Wall., Cat. no. 7237 (1832), nom. nud.

A perennial herb, up to 30 cm high. Rizomes long elongate, nearly cylindrical, solid, usually (1.5–)2–3(–4) cm thick, up to 40 cm long, usually sparsely branched, brownish, marked by transversely elliptic or orbiculate scars of flowering stems, creeping except the ascending or suberect upper part, the upper part mostly epigaeous, densely armed with the former years' flowering stems, the apical part densely covered with scaly leaves. Scaly leaves chartaceous, rigidulous, persistent, linear-triangular to triangular or rarely concaved-triangular, acute or acuminate at the apex, entire along the margin, ferruginous in the beginning, chestnut- or pale blackish brown later, 5–20 mm long 1.7–9 mm wide. Flowering stems 12–25 in number, annual, fastigiate, simple, nearly terete, usually reddish or red purplish, densely or moderately papillate (the papilla pellucid, often capitellate, about 0.2 mm long), usually 20–30 cm long, 2.2–3.3 mm thick at anthesis, not or slightly accrescent later, remaining over one year after death, the remains of former years' flowering stem reddish brown, hollow. Leaves alternate, relatively densely arranged throughout, loosely imbricate, spreading widely, sessile, slightly spurred (the spur 0.3 mm long, round), thick herbaceous, flat, narrowly obovate (SADT n. 45 or 46) or narrowly elliptic (SADT n. 1 or 2), usually 6–20 mm long 2.5–7 mm wide, usually obtuse but often acute at the apex, attenuate or shortly attenuate at the base, remotely and irregularly crenulate-denticulate or nearly entire along the upper half of the margin (the teeth 6–12 in number, usually concave or straight in the apical side, convex in the basal side, round at the apex, 0.2–0.3 mm long) or usually entire along the lower half, dark or deep green above, slightly glaucous or pale green beneath, densely papillate along the margin, sparsely to moderately papillate above (the papilla pellucid, round at the apex, usually 0.05–0.15 mm long), epapillate beneath, the costa shallowly depressed above, distinctly raised beneath, the lateral veins obscure, usually 4–6 on each side of the costa, nearly parallel, densely anastomosing towards the margin. Inflorescences terminal, usually 10–50-flowered, bracteate, usually dense in male plants and rather loose in female plants, nearly hemispherical, usually 2.5–4 cm (♂), 4–10 cm (♀) across, forming a compound-corymb, the cluster (4–)3–5(–6) in number, usually 1.5–2 cm (♂), 3–5 cm (♀) long; peduncles usually 1–1.5 cm (♂), 1.5–2 cm (♀) long; pedicels 0.8–3 mm long, nearly terete, mostly densely or rarely moderately papillate (the papilla about 0.1 mm long, pellucid), reddish or red purplish; bracts leafy, very similar to the upper cauline leaves in shape, usually 3–10 mm long 1–4 mm wide. Flowers in middle June to August, dioecious, mostly 5-merous, but occaisionally commixed 4-merous (15–46 % in each flowering stem), 6–8 mm (♂), 4–5 mm (♀) across at flowering, the alabastrum dark purplish red or deep red, oblong. Calyx (3–)4–5(–5.5) mm long, glabrous, the tube funnel-shaped, green, 2–3.5 mm long, nearly equalling the lobes in length, in female plants more or less rigid and slightly thickening; the lobes 5/7–3/4 as long as the petal, 1.5–2.7(–3) mm long 0.4–0.6 mm wide at the base, narrowly triangular or subulate, nearly entire along the margin, round at the apex, somewhat round outside, flattish inside, spreading in male plants, ascending or suberect and appressed to the ovaries in female plants, green but often reddish or dark purplish red; the sinus between lobes round (♂) or truncate (♀). Petals distinct, sessile, dark red purple or deep red, deeper towards the margin, somewhat yellowish in the lower half of inside, usually oblong-ovate or narrowly oblong-ovate, 2.5–4.5 mm long, 1.3–1.8 mm wide, nearly entire or often gnawed or minutely erose along the margin, round or obtuse at the apex, somewhat fleshy, glabrous, spreading widely (♂) suberect (♀) at flowering, flattish or very slightly round outside, slightly concave inside. Stamens distinctly shorter than the petal (about 2/3 of the petal-length), ascending or suberect at anthesis; filaments subulate, nearly terete but slightly obcompressed towards the base, fleshy, glabrous, reddish or pale purplish red (deeper towards the apex), about 0.5 mm wide at the base, the epipetalous ones inserted about 0.8 mm from the base, 1.2–2.4 mm long, the alternipetalous ones 2–3 mm long; anthers basifixed, ovoidal, usually 0.7–0.8 mm long, slightly retuse at the apex, before anthesis purplish red, just before the dehiscence deep red-purple, after dehiscence turning yellow. Nectar-scales square or square-ovate, very shallowly retuse at the apex, usually recurved in the upper 1/3 part, blackish purple or dark purplish red, usually 0.7–0.9 mm long 0.6–0.7 mm wide 0.3 mm thick. Gynoecium of female plants usually 4.5–5.5 mm long, twice to thrice of the petal, connected about 1.5 mm ventrally at the base, the connected part adnate to the calyx-tube dorsally, sessile, erect, red-purplish, the ovary more or less straight ventrally, dorsally tapering to both ends from the middle, opposite to the calyx-lobe and nectar-scale, usually 1.2–1.7 mm wide at the middle, the style very short, about 0.5 mm long, usually somewhat outcurved, the stigma very slightly swelling, epapillate, often dark purplish red; the placenta nearly marginal. Gynoecium of male plants usually 2–2.5 mm long or rarely absent, distinctly shorter than the stamens. Ovules of female plants 10–14 in each locule, mostly descending, ellipsoidal, somewhat elongate in the apical part, obtuse at the apex, usually 0.8–1 mm long, the funicles about 0.2 mm long; ovules of male plants 2–4 in each locule, about 0.4 mm long, ellipsoidal, round at the apex, probably abortive. Follicles 7–8 mm long, erect, brown. Seeds chestnut-brown, 2.5–3 mm long, ellipsoidal with elongate apex.

Distr. Nepal, Sikkim, Tibet, Bhutan, and Yunnan.

Specimens examined. Nepal. Lantang, alt. 12500–13000 ft. (Polunin 205, BM); Lantang Valley, alt. 13000 ft. Flowers dark red (Schilling, Sayers & Bista 379 ♀, KATH); Mul Kharka, Chilime Khola, alt. 4100 m (Kanai & Shakya 672265 ♂, TI, KATH); Gosainkund, alt. 4000 m. On exposed rocks. Flowers dark shining red (Kanai, Hara & Ohba 726289 ♀, TI); Patuiages de Kunde–Khumsung, alt. 3810 m. Sur un bloc de rocker parmi les *Rhododendron.* Fleurs blanches ponctuées de pouipse, exposition sud (Zimmermann 701, BM); Bhurchula Lekh, near Jumla, alt. 12500 ft. On rock ledges. Inflorescence red except for sepals which are green externally (Polunin, Sykes & Williams 4657 ♀, BM, KATH); Near Pudamigaon, Suli Gad, alt. 12500 ft. Among rocks, growing in moist soil, exposed. Flowers dull reddish, stamens with yellowish anthers (Polunin, Sykes & Williams 2243, BM, KATH); Taglung, S. of Tukucha, Kali Gandaki, alt. 12000 ft. Open rocky slopes. Corolla & filaments dark red (Stainton, Sykes & Williams 1728 ♀, BM, KATH) Thorungse Pass, Muktinath, alt. 14500 ft. Open rocky slopes. Petalsand filaments dark red (Stainton, Sykes & Williams 1478, KATH); Thinigaon, Mukt-

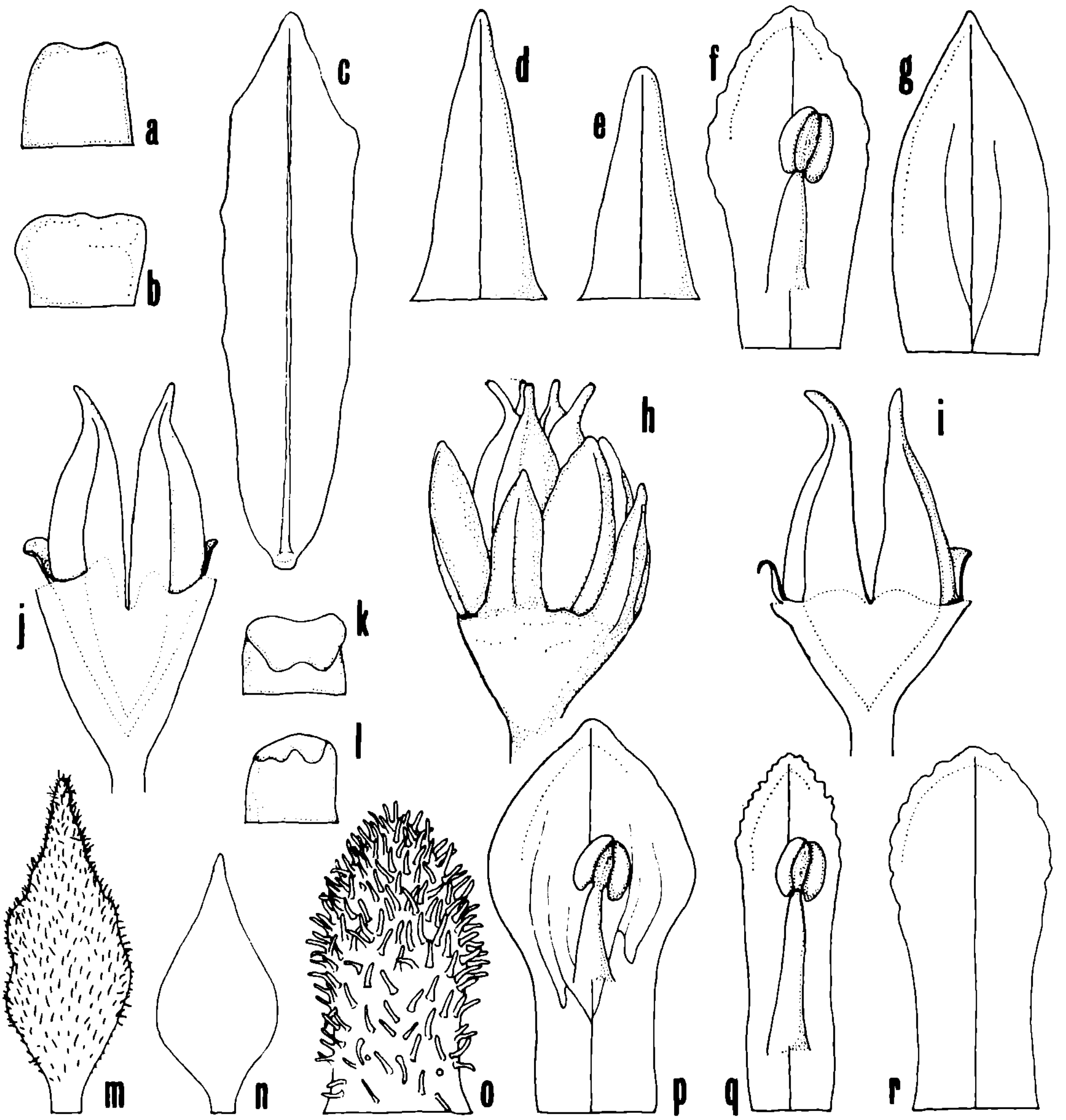

Fig. 52. *Sedum himalense* D. Don (a–i). a & b. Nectar-scales in dorsal view, × 15, c. Cauline leaf, × 3.75, d & e. Calyx-lobes, × 7.5, f. Petal of male flower with stamen, × 7.5, g. Petal of female flower, × 7.5, h. Female flower, × 7.5, i. Pistils in longitudinal section, × 7.5. *Sedum Bouvieri* R.-Hamet (j–r), j. Pistils in longitudinal section, × 7.5, k & l. Nectar-scales in dorsal view, × 15, m & n. Cauline leaves, × 3.75, o. Calyx-lobe, × 7.5, p & q. Petals of male flowers, × 7.5, r. Petal of female flower, × 7.5. (a, d, g–i. Kanai et al. 726325, b, c, e & f. Stainton 376, j, l, m, o & r. Duthie 5565 in K, k, n & p. Duthie 5565 in BM, q. Presented by Reid in K).

inath Himal, alt. 13500 ft. At edge of stream. Inflorescence and stem red (Stainton, Sykes & Williams 1332 ♀, BM, KATH); Balangra Pass, alt. ca. 13500 ft. Among boulders and rocks. Flowers reddish (Polunin, Sykes & Williams 1041, BM, KATH); Jargeng Khola, alt. 14000 ft. Among dwarf bushes on open hillside. Flowers crimson to carmine; leaves green (Lowndes 1120, BM); Manaslu (Nakao s.n., KYO); Kangrang La, 27° 25′ N, 88° 03′ E, alt. 12700 ft. On rock ledges. Stem and flowers red (Williams 697, BM, TI); Changyam Khola, alt. 14000 ft. Shrubland. flowers (♀) red (Gardner 736 & 740, BM, TI); Kyanchin Gomba, 28° 13′ N, 85°44′ E, alt. 3700 m (Dobremez 1066, BM); Solu Khola, N. of Junbesi, 27° 30′N, 86°30′ E, alt. 13000 ft. Among dwarf *Rhododendron*. Tufted habit (Mc Cosh 254, BM, TI); Rolwaling, 27°55′ N, 86° 23′ E, alt. 15500 ft. Flowers red (Stainton 4727, BM); Bagmati Zone, Rasuwa District, E. of Khangyin, alt. 3700 m. South facing slope among *Berberis* along track. Red colored (Nicolson 2607, BM, KATH); Jangba, alt. 14–15000 ft. Fls. black-red (Dhwoj 210, BM); Jata Pokhari, alt. 14–15000 ft. Flowers dark (Dhwoj 630, BM); Thudam, Arun Valley, E. of Chyamtang, alt. 12500 ft. Amongst rock and small shrubs. Petals & filaments dark red (Stainton 376, BM, TI); Kyangin Kharka areas, alt. 13000 ft. On rock. Stem red (Malla 9178, BM); Gosa–Banduke Pokhari, alt. 4100–4200 m. On mossy rock (Kanai, Ohashi, Iwatsuki, Ohba & Shakya 726326, TI); Banduke Pokhari–Saju Pokhari, alt. 4000–4200 m. On mossy rocks or margin of dwarf *Rhododendron* shrubs. Flowers dark purple red (K.O.I.O.&S. 726319–22 ♂, 726328–29 ♂, TI); Saju Pokhari–Topke Gola, alt. 4300–3700 m. Abundant on stony bed or rocks by stream (K.O.I.O. & S. 726323 ♀, TI); Topke Gola, alt. 3600 m (K.O.I.O. & S. 726324 ♂ & 726325 ♀, TI); Janga La–Thudam, alt. 4200–3400 m. Abundant along streams. Flowers red purple (K.O.I.O. & S. 726330 ♂ & 726331 ♀, TI); Thudam–Lama Chungbu, alt. 3400–4200 m. Abundant on exposed or more or less shaded rocks by or near streams. Flowers red purple (K.O.I.O. & S. 726299 & 726300 ♀, TI); Lama Chungbu–Samdan, alt. 4200–4400 m. Stony floor of shrubs near streams. Flowers reddish (K.O.I.O. & S. 726301–726312, TI); Thudam–Kipudonsu, alt. 3400–4200 m. Abundant along streams (K.O.I.O. & S. 726287 ♂ & 726288 ♀, TI); Phujeng La–Topke Gola, alt. 3800 m. Abundant along streams (K.O.I.O. & S. 726314–726318, TI). Sikkim. regio. alp. alt. 12–17000 ped. (Hooker s.n., CAL); alt. 16500 ft. (Gammie 903, CAL); above Lung too Sha–Can bee (King's collector s.n., CAL); Jongri to Alokteng, alt. 13–15000 ft. (Anderson 600, CAL); Jongri, alt. 14000 ft. (Gammie 158, CAL); Jongri–Gamotang, alt. 3600–4200 m. Flower dark purple-red (Hara, Kanai, Murata, Togashi & Tuyama 6665, TI); Gamotang–Megutang, alt. 3900 m (H.K.M. & T., T. 6678, TI); along the Choksering Chu, north of Jongri, alt. 4000–4500 m. Flower dark purple-red (H.K.M.T. & T. 6664, TI); Rishenong, alt. 13000 ft. (Ribu & Rhomoo 4505 ♀, CAL). Tibet. Phari, alt. 14–15000 ft. (Bigenld 44 ♀, CAL). Bhutan. (Dungboo s.n., CAL); Bhorntang, Dhur Chu, alt. 15200 ft. Among rocks. Abundant. Flowers dark red & showy (Bowes Lyon 3388 ♂, BM); Parshary Zempur, alt. 12500 ft. On scree. (Cooper 3020, BM); Laum Thang–Chawa Gassar, alt. 4700 m (Hara, Kanai, Murata, Ohashi, Tanaka & Yamazaki s.n. ♀, TI); Laya–Laum Thang, alt. 3800 m (H.K.M.O.T. &Y. s.n. ♂, TI); Bhumthang, alt. 15000 ft. (Chaubin 147, TI).

Sedum himalense is easily distinguishable from other species by the reddish and densely papillate flowering stems, dark red petals and shining blackish purple nectar-scales, etc.

In my field observations in E. and C. Nepal, this species seems to characterize the vegetation of such exposed habitats as scree, boulder drift and stream side and the rock- or soil-floor of dense bushes of *Rhododendron Anthopogon*, *R. setosum* and *R. lepidotum* in altitudes from 3600 m to 4600 m. Moreover, from 3600 m to 3800 m *S. himalense* often grows on shady rooks along ravines in broad-leaved deciduous forests containing *Salix*, *Prunus*, *Acer*, etc. *S. himalense* was found in most localities with mosses belonging to the genera *Breuteria*, *Dicranum*, *Plagiochila*, *Tortula*, *Calliergonella?*, *Thuidium*, *Campylopus*, *Actinothuidium*, *Plagiothecium*, *Onchophorus*, *Rhacomitrium*, etc.

Sedum Bouvieri R.-Hamet in Journ. Bot. **54**: suppl. 11 (1916)–Praeger in Not. Bot. Gard. Edinb. **13**: 74 (1921)–Berger in Engl. et Prantl, Nat. Pfl.-fam. 2 Aufl. **18**a: 442 (1930). [Fig. 52 j–r]

Sedum quadrifidum Pallas var. *Bouvieri* (R.-Hamet) Fröd. in Act. Hort. Gothob. **5**: append. 32 (1930).

Chamaerhodiola Bouvieri (R.-Hamet) Nakai apud Nakai et Kitagawa in Rep. 1st Sci. Exped. Manch. Sect. IV, **1**: 30 (1934).

A perennial herb, up to 15 cm high. Rhizomes more or less elongate, nearly cylindrical, solid, usually 0.5–1.2 cm thick, up to 7 cm long, bifurcate when well developed, ascending to nearly erect, the upper part epigaeous, densely armed with the remains of the former years' flowering stem, the apical part densely covered with scaly leaves. Scaly leaves thick chartaceous, somewhat rigid, long persistent, triangular or triangular-semicircular or broadly triangular-ovate, entire along the margin, attenuate or obtuse at the apex, 3.5–7 mm long 1.8–6.5 mm wide, dark or chestnut-brown. Flowering stems 4–10 in number, annual but remaining over one year after death, fastigiate, simple, nearly terete, usually pale reddish, very densely papillate (the papilla pellucid, persisent, (0.1–)0.2–0.4(–0.5) mm long), usually 4–9 cm long 0.7–0.8 mm thick at anthesis; the remains of the former years' stem pale reddish but gradually changed straw-coloured. Leaves alternate or often nearly opposite, more or less remotely arranged throughout, spreading widely, nearly sessile, spurless, thick herbaceous, flat, usually ovate, entire or very shallowly repandous along the margin, usually attenuate or acute at the apex, usually shortly attenuate at the base, 5–12 mm long 2.2–5.3 mm wide, very densely papillate (the papilla pellucid, 0.2–0.3(–0.4) mm long, conspicuous, 15–25/ mm along the margin, 30–50/ mm^2 on both surfaces), the costa not prominent. Inflorescences terminal, usually (3–)5–6(–7)-flowered, bracteate, usually 3–12 mm long 5–20 mm wide, forming a simple- or monochasial-corymb; pendruncles 4–7 mm long, nearly terete, densely or moderately papillate; pedicels usually nearly 0–1 (–2) mm long, densely or moderately papillate (the papilla 0.1–0.3 mm long); bracts leafy, very similar to the upper cauline leaves in shape, usually 2–4 mm long 1.1–2 mm wide. Flowers in July, dioecious, mostly 5-merous, usually 3.5–4 mm across at anthesis. Calyx 2.5–3.8 mm long, moderately papillate outside (the papilla pellucid, 0.2–0.3 mm long) the tube usually 0.8–1.5 mm long, gradually or somewhat abruptly narrowed towards the base; the lobes usually 1.7–2.5 mm long, 0.7–1.5 mm wide, narrowly oblong (SADT n. 14) or narrowly oblong-ovate, mostly entire along the margin, round or triangularly round in the apical part, round or obtuse at the apex, nearly parallel in the lower half, more or less fleshy, slightly convex outside, flat inside, ascending at anthesis, the papilla dense towards the margin and apex, the sinus between lobes obtuse or truncate. Petals distinct, sessile, reddish(?), usually narrowly oblong-spathulate or narrowly oblong-obovate, usually 2.7–3.2 mm long 0.8–1.9 mm wide, broadest at the 2/3 from the base, round in the apical part, round and usually more or less bitten at the apex, nearly entire or erose along the margin, shallowly boat-shaped, somewhat fleshy, glabrous, epapillate inside but usually sparsely or moderately papillate along the costa outside (the papilla pellucid, usually 0.1–0.2 mm long), spreading at anthesis. Stamens distinctly shorter than the petal, suberect or ascending at anthesis; filaments subulate, fleshy, obcompressed, glabrous, epapillate, about 0.5 mm wide at the base, the epipetalous ones inserted 0.3–0.7 mm from the base, 1.2–1.4 mm long, the alternipetalous ones 1.5–1.7 mm long; anthers basifixed, nearly globose, usually 0.4–0.6 mm long, round or very slightly retuse at the apex, before anthesis reddish(?), after dehiscence yellow. Nectar-scales nearly square or obovate, very shallowly retuse at the apex, recurved in the upper 1/5 part, probably reddish, usually 0.5–0.7 mm long 0.4–0.6 mm wide 0.15 mm thick. Gynoecium of female plants usually 3.7–4.5 mm long, 1.4–1.7 times longer than the petal, usually connected ventrally 0.7–1.3 mm from the base, erect, the ovary straight ventrally, tapering from the base of the distinct part, connected part more or less adnate to the calyx-tube dorsally, 1–1.2 mm wide, opposite to the calyx-lobe, the style short, usually 0.5–0.7 mm long, tapering from the base, more or less outcurved, the stigma very minutely mamillate, the placenta nearly marginal. Gynoecium of male plants usually 0.9–1.8 mm long, distinctly shorter than the stamens. Ovules 10–14 (♀) or 2 (♂) in each locule, mostly descending, very narrowly oblong, usually 0.5–0.6 mm (♀) or 0.4 mm (♂) long, round at the apex; those of male plants probably abortive. Follicles usually 4–5 mm long, erect, dark brown.

Distr. Nepal.

Specimens examined. Nepal. Rocks in Nampe Gadh, alt. 13000 ft. (Duthie on July 27, 1886, No. 5565, BM, K–Type collection of *Sedum Bouvieri* R.-Hamet); Height above Chahlek, Byans, alt. ca. 12000 ft. (unknown collector s.n., presented by Reid, E).

In having conspicuous papillae on stems, leaves, calyx and petals, this species easily distinguishable from other species. *Sedum coriaceum*[1] resembles this species in having puberulous leaves, but seems to differ in the shape of leaf, i.e. obovate against ovate in the latter. By courtesy of Prof. Hara, I was able to examine the photograph of the holotype of *S. coriaceum* in K. The type specimen, i.e. Wallich 7328, seems to be remarkably robust than *S. Bouvieri*. However *S. coriaceum* should be remain for further studies based on the authentic specimens.

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1) *Sedum coriaceum* Wall. [Cat. no. 7328 (1832), nom. nud.] ex Hook. f. et Thoms. in Journ. Linn. Soc. Bot. **2**: 99 (1858)–C. B. Clarke in Hook. f., Fl. Brit. Ind. **2**: 419 (1878).

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THE GENUS *HEDYSARUM* (LEGUMINOSAE) IN THE HIMALAYAS

by

Hiroyoshi Ohashi and Yoichi Tateishi

The Himalayan species of the genus *Hedysarum* were studied for the first time by Baker (1876). He recognized eight species from the region and all these species were considered as endemic to the Himalayas, mostly to West Himalaya. Since then several investigations have been made in connection with the Himalayan species. Prain (1897) suggested that *Hedysarum laxiflorum* Benth. ex Baker was identical with *H. sibiricum* Poir. In a monograph of the genus by B. Fedtschenko (1902) *H. Falconeri* Baker was treated as a variety of the widespread species *H. obscurum*, which is now considered as a synonym of *H. hedysaroides*. *H. strobiliferum* Baker was identified by Fedtschenko as *Astragalus chlorostachys* Lindley. Also, he reported the occurrence of *H. sikkimense* eastwards in Yunnan. Ali (1972) reported the extension of distribution of *H. minjanense* Rech. f., an Afghan species, to Chitral and Kashmir. Ohashi (1974 & 1975) described two new species and one new variety from Central Nepal, and treated *H. strobiliferum* as a distinct species of *Astragalus* with a discussion on the distinction between *Hedysarum* and *Astragalus*. However, *A. manaslensis* Kitamura (1957) was proved to be identical to *H. nepalense* Ohashi.

In the present paper one new species and one new variety are described, and one new combination is proposed. However, there remain several hitherto unrecognized forms in the Himalayas especially in the Tibetan regions. Moreover, as we could not examine the Himalayan specimens of *H. minjanense*, this species is excluded from the present paper. Judging from the original description of the species, *H. minjanense* is apparently near to *H. kumaonense*. Under these circumstances, at present we recognize nine species, one subspecies, and two varieties from the Himalayas as follows:

1. *Hedysarum alpinum* L.
   subsp. *laxiflorum* (Benth. ex Baker) Ohashi et Tateishi
2. *H. astragaloides* Benth. ex Baker
3. *H. cachemirianum* Benth. ex Baker
4. *H. campylocarpon* Ohashi
5. *H. Falconeri* Baker
6. *H. kumaonense* Benth. ex Baker
7. *H. manaslense* (Kitamura) Ohashi
   7′. var. *nepalense* (Ohashi) Ohashi
8. *H. microcalyx* Baker

9. *Hedysarum pseudomicrocalyx* Ohashi et Tateishi
10. *H. sikkimense* Benth. ex Baker
10′. var. *megalanthum* Ohashi et Tateishi

These plants listed above have been classified into two sections, i.e., Sect. Subacaulia B. Fedtschenko and Sect. Gamotion Basiner. Only *Hedysarum kumaonense* belongs to the former section, and all others belong to the latter. However, floral characteristics in the Himalayan species treated in the present paper seem to show different taxonomic features from what have been recognized by classifying these sections. Especially the differences in the wings and the calyces are remarkable among these species (Fig. 53). *H. campylocarpon* and *H. manaslense* are characterized in having the wings usually longer than the standard and keel-petals, and the 4-lobed calyx. In *H. cachemirianum* the wings are almost as long as the other petals and have an elongate claw and a short auricle, and the calyx is tubular. The wings of *H. astragaloides* and *H. microcalyx* have a long auricle with a slightly expanded apex, but the shape of the calyx differs from each other as shown in Fig. 53. In *H. kumaonense, H. Falconeri* and *H. cachemirianum* the auricles of the wings are apparently shorter than the claw, but these three species are different conspicuously in the calyces and keel-petals. The calyx of *H. kumaonense* is characterized by its elongate upper lobes. On the basis of the differences in floral morphology, therefore, the Himalayan species of *Hedysarum* may be regarded as an assemblage of considerably heterogeneous species. Although the present work is preliminary, the following five species-groups can be recognized: (1) *H. campylocarpon* and *H. manaslense*; (2) *H. sikkimense, H. pseudomicrocalyx, H. alpinum* subsp. *laxiflorum, H. microcalyx* and *H. astragaloides*; (3) *H. kumaonense*; (4) *H. Falconeri*; and (5) *H. cachemirianum.*

The present study is based mainly on the specimens of the Herbarium, Department of Botany, Faculty of Science, University of Tokyo (TI); British Museum (Nat. Hist.) (BM); and Royal Botanic Gardens, Kew (K). We wish to express our thanks to the authorities at the British Museum (Nat. Hist.) and the Royal Botanic Gardens, Kew, for enabling us to study the specimens in their charge. We also indebted to Dr. Hiroshi Hara, Professor Emeritus of the University of Tokyo, for his valuable suggestions and criticisms.

Key to the species, subspecies and varieties.

1. Almost acaulescent. Calyx 5-lobed, all the lobes equal or the upper lobes a little longer than the others. Standard and keel-petals equal and longer than the wings, wings 10.5–13.5 mm long, keel-petals 14.5–15.5 mm long; auricle of wings shorter than the claw, 1–1.5 mm long. Pods 1–2-jointed, without wings along the margin, the articles 8–9 mm long .... *H. kumaonense*
1. Caulescent, erect herbs 2
    2. Leaves whorled. Calyx 5-lobed, lateral and lower lobes nearly equal and longer than the upper lobes. Keel-petals longer than the standard, wings shorter than the standard, wings 12–15 mm long, keel-petals 14.5–18 mm long; auricle of wings slightly expanded at the apex, longer than or

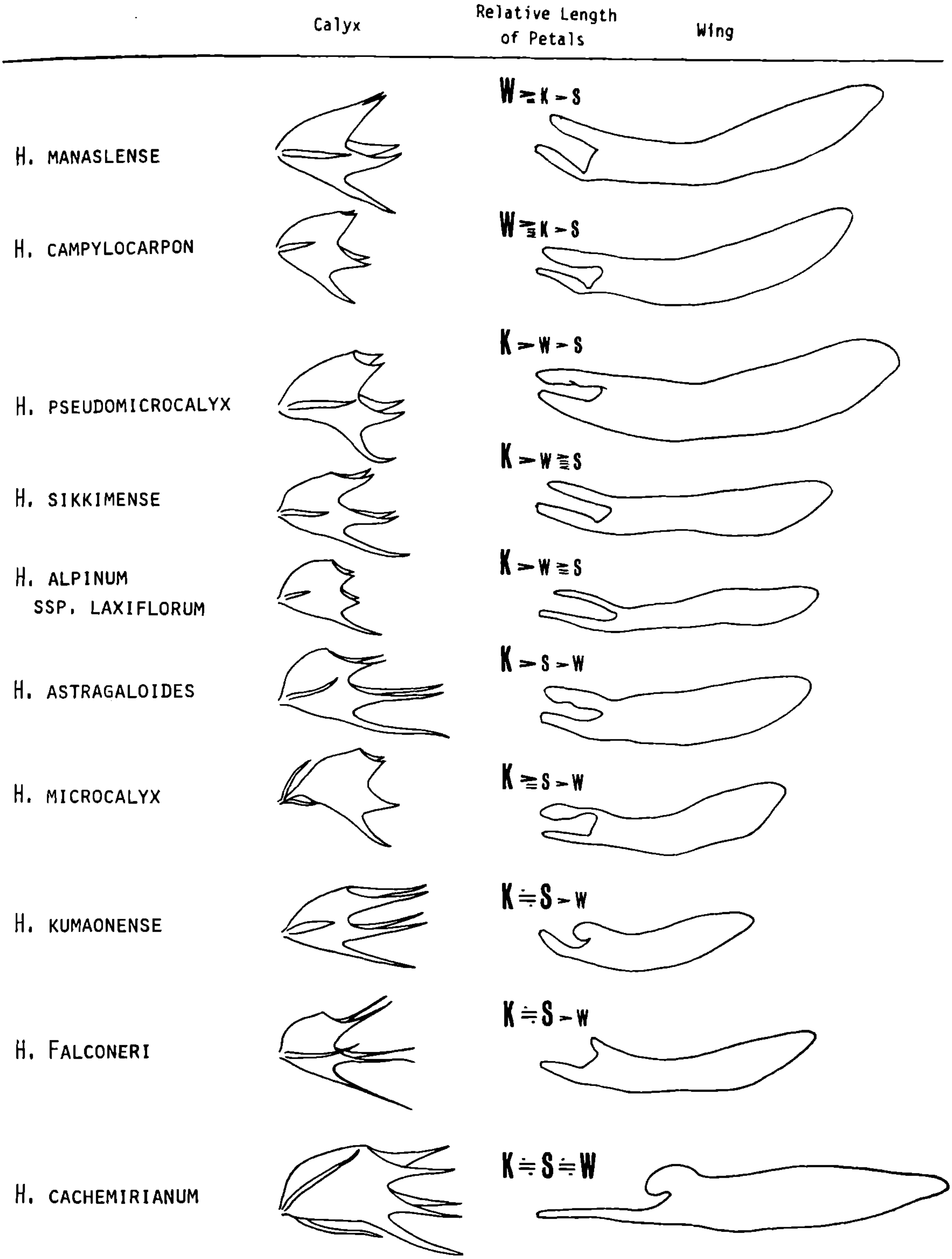

Fig. 53. The calyces and wing-petals of the Himalayan species of *Hedysarum*, showing differences in shape and size among the species, and, at the same time, relative length of petals in each species respectively; S: standard, W: wing, and K: keel-petal. For example, in *H. manaslense* the calyx is 4-lobed and the wing-petal is longer than the keel-petal or rarely as long as it, and both wing and keel-petal are longer than the standard. In *H. Falconeri* the calyx is 5-lobed, and the keel-petal and the standard are nearly equal and longer than the wing-petal.

as long as the claw, 2.5–3.5 mm long. Bracteoles distinctly shorter than the calyx-tube. Pods (1–)2–3-jointed, with wings along the margin, the articles 8–18 mm long .... *H. microcalyx*

2. Leaves opposite. Calyx 5-lobed, lateral and lower lobes nearly equal and distinctly longer than the upper lobes. Keel-petals longer than the wings, wings longer than the standard, wings 20–21 mm long, keel-petals 24.5–26 mm long; auricle of wings not expanded at the apex, almost as long as the claw, 3.5–4 mm long. Bracteoles nearly equalling the calyx-tube .... *H. pseudomicrocalyx*
2. Leaves alternate 3
   3. Calyx 4-lobed. Wings usually longer than the standard and keel-petals; auricle of wings as long as the claw, 3.5–4.5 mm long. Pods 2.5–4 cm long, 2–3(–4)-jointed 4
      4. Calyx 4–6 mm long, the tube apparently longer than the lobes, lateral and lower lobes 1.2–2.5 mm long. Pods pendulous, irregularly crenulate to toothed along the margin .... *H. campylocarpon*
      4. Calyx 7–8 mm long, the tube more or less longer than the lobes, lateral and lower lobes 3–4 mm long. Pods ascending, entire along the margin .... 5. *H. manaslense*
         5. Standard puberulent .... var. *manaslense*
         5. Standard glabrous .... var. *nepalense*
   3. Calyx 5-lobed. Wings not longer than the keel-petals 6
      6. Standard nearly equalling the keel-petals; auricle of wings shorter than the claw, 1–1.5 mm long. Lateral calyx-lobes about 4 mm long 7
         7. Calyx-tube tubular, 5–6 mm long, calyx-lobes acuminate at the apex. Claw of wings elongated, about 7 mm long; wings almost as long as or a little shorter than the keel-petals. Pods (1–)2–3-jointed, the articles 1.3–2 cm long, with irregularly erose-dentate wings along the margin .... *H. cachemirianum*
         7. Calyx-tube campanulate, 2.5–3.5 mm long, calyx-lobes long-cuspidate at the apex. Claw of wings short, 3–3.5 mm long; wings distinctly shorter than the keel-petals. Pods 1–3-jointed, the articles 1–1.3 cm long, with almost entire wings along the margin .... *H. Falconeri*
      6. Standard shorter than the keel-petals; auricle of wings elongated, almost as long as the claw, more than 2.5 mm long 8
         8. Lower and lateral calyx-lobes nearly equal, 4–6 mm long. Corolla yellowish. Wings shorter than the standard. Pods 1–2-jointed, with distinct wings .... *H. astragaloides*
         8. Lower calyx-lobes longer than the lateral lobes. Wings longer or a little shorter than the standard 9
            9. Calyx glabrous or nearly so on the tube. Wings equalling or longer than the standard. Ovary glabrous. Bracts 2–3 mm long, shorter than the pedicel. Pods (3–)4-jointed, without wings, the articles

shorter than 6 mm .... *H. alpinum* subsp. *laxiflorum*

9\. Calyx densely pubescent to rarely subglabrous. Corolla mauve to reddish purple. Ovary densely pubescent. Bracts 3.5–10 mm long, longer than the pedicel. Pods with narrow wings, the articles longer than 8 mm .... 10. *H. sikkimense*

10\. Flowers 23–28 mm long. Ovary 5-ovuled. Leaflets with uniformly appressed white hairs below .... var. *megalanthum*

10\. Flowers 13–18(–19) mm long. Ovary 2(–3)-ovuled. Pods 1–2(–3)-jointed. Leaflets hairy along the midrib below . . . var. *sikkimense*

1) **Hedysarum alpinum** L., Sp. Pl. ed. 1, 750 (1753)
subsp. **laxiflorum** (Benth. ex Baker) Ohashi et Tateishi, comb. nov.
[Pl. 13g. Figs. 54, 70d, 71c]

H. laxiflorum Benth. ex Baker in Hook. f., Fl. Brit. Ind. **2**: 146 (1876).
H. sibiricum Poir. sensu Prain in Journ. Asiat. Soc. Beng. **66** (2): 378 (1897).
H. alpinum L. sensu B. Fedtsch. in Act. Hort. Petrop. **19**: 253 (1902).

A perennial, 30–120 cm high; stems erect, slender, glabrous or very sparsely pubescent. Stipules leaf-opposite, membranaceous, connate, about 7 mm long, glabrous. Leaves alternate, usually 10–15 cm long, glabrescent or appressed-pubescent along the rachis; leaflets 8–16 pairs, narrowly ovate (37)[1] or narrowly elliptic (2), retuse to obtuse or acute at the apex, (10–)15–25(–30) mm long, (4–) 5–10 mm broad, entire along the margin, glabrous above, appressed-pubescent on the costa below, lateral veins (8–)12–18 pairs, rather prominent below. Racemes 10–30-flowered, 8–17 cm long including the peduncle, glabrescent or pubescent on the rachis. Bracts early deciduous, narrowly ovate (37), acuminate or often acute at the apex, 2–3 mm long. Pedicels 3–6 mm long, nearly glabrous or rather densely pubescent with appressed silky hairs. Bracteoles narrowly ovate (36), 2–3 mm long and less than 0.4 mm wide. Calyx 4–6 mm long, nearly glabrous on the tube and minutely pubescent on the lobes, 5-lobed; tube 3–3.5 mm long, the lower lobe longer than the other lobes, narrowly triangular (73) to narrowly ovate (36), 2–2.5 mm long, the upper and lateral lobes deltate, about 1 mm long. Corolla (colour unknown): Keel-petals longer than the other petals, standard shorter than or almost as long as the wings. Standard narrowly obovate (46–47), emarginate at the apex, 14–15 mm long and about 6 mm wide, glabrous; wings 14–16 mm long including the claw (claw 3–4 mm long), 1.7–2.3 mm wide, the lamina nearly narrowly elliptic (1), long-auriculate (auricles linear, 3–3.5 mm long), obtuse at the apex; keel-petals 16.5–18 mm long including the claw (claw 5–6 mm long), 4.5–5.5 mm wide, shortly auriculate at the base. Androecia diadelphous, vexillar stamen 14–16 mm long, 3–5 mm shorter than the longest one of the other stamens. Gynoecia sessile or minutely stiped, 20–22 mm long, the ovary 4-ovuled, 6–7 mm long, glabrous, the style 14–15 mm long, glabrous. Pods (Fig. 70d) (3–)

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[1] The number in parentheses after the shapes of leaflets, bracts, bracteoles, calyx-lobes, petals and articles of pods is correspond with that in the Chart of simple symmetrical plane shapes by the Systematics Association Committee for descriptive Biological Terminology (cf. Taxon **11**, 1962).

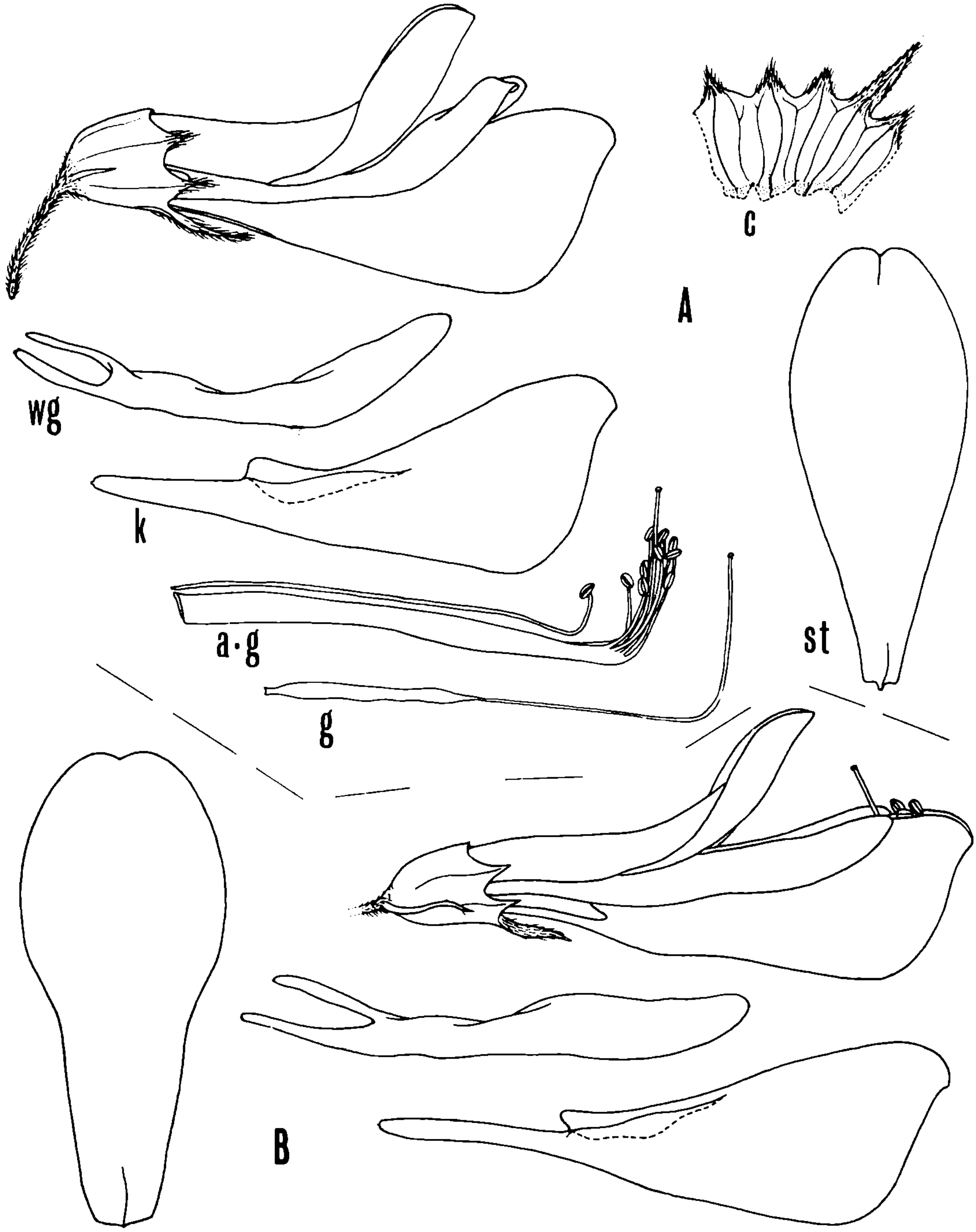

Fig. 54. Flowers of *Hedysarum alpinum* subsp. *laxiflorum*. c. Calyx from inside, st. Standard, wg. Wing, k. Keel-petal, a·g. Androecium and gynoecium, g. Gynoecium. All ×4. A from J. E. Winterbottom, 25 June 1847 (Syntype of *H. laxiflorum*), B from B. O. Corentry 1539.

4-jointed, stiped (the stipes about 3 mm long), glabrous, reticulate-nerved on both surfaces, both sutures without wings; articles broadly elliptic (5), 5–6 mm long and 4–5 mm wide. Seeds (Fig. 71c) about 3 × 2.2 × 1 mm in size.

Distr. West Himalaya and West Tibet (Fig. 55).

Specimens examined: West Tibet. (Falconer 440 k–Lectotype of *H. laxiflorum*).

KASHMIR. Valley of Kishengunga (J. E. Winterbottom, 25 June 1847, K-Syntype of *H. laxiflorum*); No precise locality (B. O. Corentry 1539 K).

In general habits and the shape of flower petals *Hedysarum alpinum* and *H. laxiflorum* are very close to each other. So it seems to be natural to regard them as conspecific, but *H. laxiflorum* differs apparently from *H. alpinum* in having lax-flowered racemes, distinct lower calyx-lobe which is longer than the other lobes, deciduous bracts, and ascending wingless pods. The number of leaflets on a leaf is 17–33 in *H. laxiflorum* against 11–28 in *H. alpinum*.

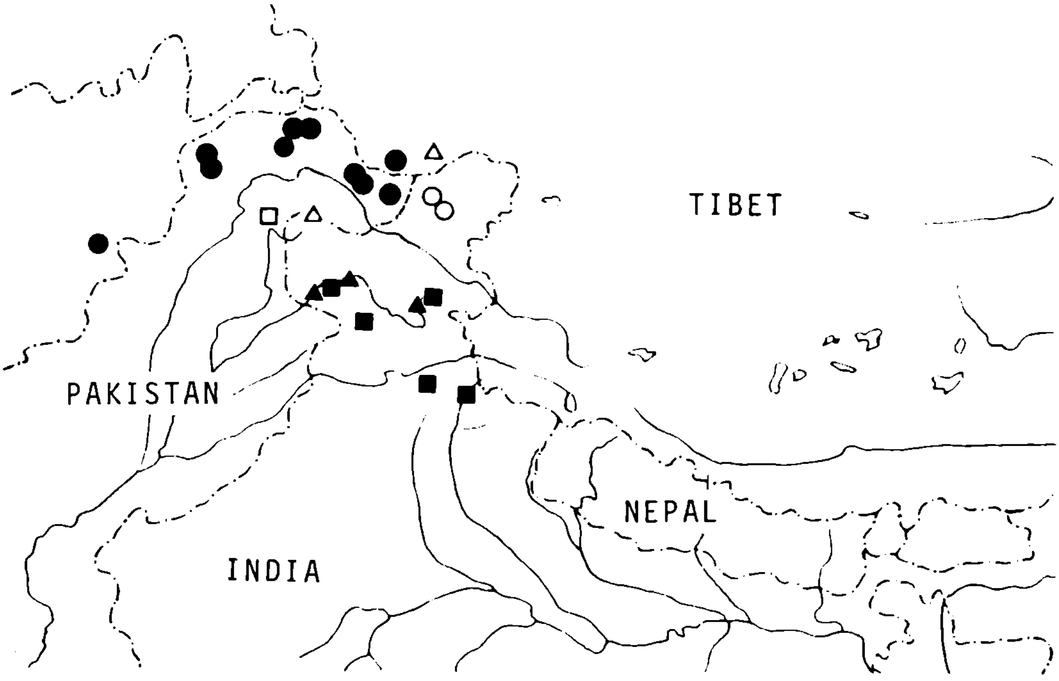

Fig. 55. Approximate distribution of the N.W. Himalayan species of *Hedysarum*. ●: *H. Falconeri*, □: *H. pseudomicrocalyx*, △: *H. alpinum* subsp. *laxiflorum*, ○: *H. cachemirianum*, ■: *H. microcalyx*, ▲: *H. astragaloides*.

2) **Hedysarum astragaloides** Benth. ex Baker in Hook. f., Fl. Brit. Ind. **2**: 146 (1876)–Aitch. in Journ. Linn. Soc. **18**: 49 (1880)–B. Fedtsch. in Act. Hort. Petrop. **19**: 252 (1902)–Kitamura, Fl. Afghanistan 231 (1960). [Pl. 12a. Fig. 56]

A perennial, 20–60 cm high; stems erect, slender to sometimes robust, with dense appressed silky hairs (0.5–1 mm long) at first. Stipules leaf-opposite, scariose, connate, usually 1–1.2 cm long, with rather densely white silky hairs outside. Leaves alternate, usually 10–20 cm long; leaflets 17–31 i.e. 8–15 pairs, narrowly ovate (37) to narrowly elliptic (2) or sometimes elliptic (4), rounded to obtuse or acute, often with a minute mucro at the apex, 15–48 mm long, (5–)7–15 mm wide, entire along the margin, upper surfaces glabrous and with uniformly very minute gland-like dots, lower surface with densely or rarely rather sparsely appressed white hairs (about 1 mm long), lateral veins obscure on both surfaces. Racemes densely 10–30-flowered or more, more than 10–25 cm long including the peduncle of 7–15 cm long, with dense appressed white hairs. Pedicels 3–5 mm

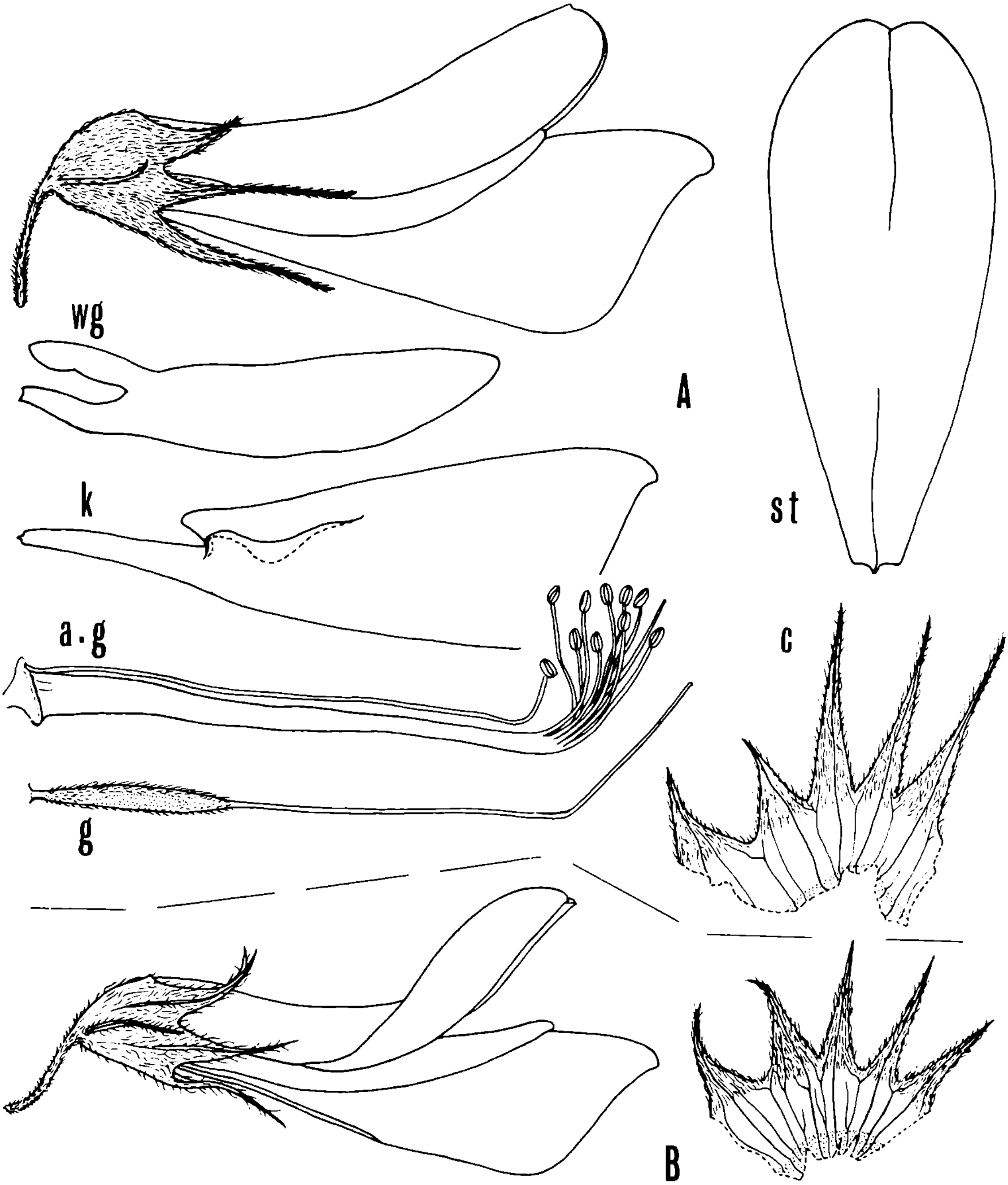

Fig. 56. Flowers of *Hedysarum astragaloides*. c. Calyx, st. Standard, wg. Wing, k. Keel-petal, a·g. Androecium and gynoecium, g. Gynoecium. All ×4. A from the lectotype, B from N. L. Bor 15388.

long, densely to very densely hairy. Bracts distinctly longer than the pedicel, subulate (72), 8–10 mm long, 0.5–0.8 mm wide, pubescent outside and along the margin, glabrous inside. Bracteoles narrowly triangular (73), 2.5–3.5 mm long, about 0.5 mm wide, hairy like the bract. Flowers (15–)18–22(–23) mm long. Calyx 6–9.5 mm long, sparsely to densely pubescent, 5-toothed, teeth more or less unequal, upper two teeth triangular (76), 3–4 mm long, about 2 mm wide at the base, lateral and lower teeth narrowly triangular (74), 4–6 mm long, 1.5–2 mm wide at the base. Corolla yellowish; standard shorter than the keel-petal, narrowly obovate (46) to obovate (47), emarginate at the apex, 15.5–18 mm long, 6–7.5 mm wide; wings clawed, 14–15.5 mm long, the lamina narrowly elliptic (2), 11–12 mm long, 2–3.5 mm wide, obtuse at the apex, auriculate at the base, the auricle 2.5–3.5 mm long, the claw about 3.5 mm long; keel-petals clawed, 17.5–20 mm long, the lamina narrowly obovate (46) to obovate (47), 12–15 mm long, 5.5–6 mm wide, usually slightly mucronate at the apex, auriculate near the base, the auricle about 1 mm long, the claw about 6 mm long. Androecia diadelphous, the vexillar stamen shorter than the others, 15–17.5 mm long, the others 17.5–22 mm long, anthers about 0.5 mm long. Pistils 19–23 mm long, shortly stiped, the ovary 5–6 mm long, (1–)2(–3)-ovuled, the style 13.5–16 mm long. Pods 1-2-jointed, stipitate, both sutures with apparent wings; articles elliptic to broadly elliptic (3–5).

Distr. Kashmir and Punjab (Fig. 55).

Specimens examined: KASHMIR. Kishtwar, 11–12000 ft. (T. Thomson, 20 June 1848 K–Lectotype, BM–Isotype); Kishtwar, Barnaj Nullals near Sappline Miues, 10000 ft., grassy slopes, fls. cream white (Ludlow & Sherriff 9134 BM). PUNJAB. Lahul (H. Jaeschke 236 K–Syntype); Billing Lumpa, 14000 ft. (N. L. Bor 15458 K); 12500 ft. (N. L. Bor 15388 K); Tugiling–Gondla (J. R. Drummond 23487 K); Upper Chenab (R. Sllis 575 K); Chenab Valley, 11000 ft. (R. Sllis 1493 K); Chenab Valley, 11000 ft. (Thomson s.n. K).

We could observe only young pods. Baker (1876) described that the pod has a distinct rather crisped wing on the lower side and an obscure one on the upper. This feature is very distinct in the Himalayan *Hedysarum*.

3) **Hedysarum cachemirianum** Benth. ex Baker in Fl. Brit. Ind. **2**: 146 (1876)–B. Fedtsch. in Act. Hort. Petrop. **19**: 244 (1902).

[Pl. 12d, d'. Figs. 57, 70a,71a]

A perennial herb. Stems 35–60 cm high, erect, pubescent but soon glabrescent. Stipules leaf-opposite, scariose, connate, up to 1.5 cm long, glabrous. Leaves alternate, usually 7–13 cm long including the petiole, leaf-rachis yellowish hairy when young but soon glabrescent; petioles usually 0.5–2 cm long. Leaflets generally opposite, 21–27 i.e. 10–13 pairs, narrowly ovate (37) or narrowly elliptic (2), obtuse but occasionally apiculate at the apex and obtuse to rarely more or less cordate at the base, 1.5–2.5(–3.3) cm long and 5–10 mm wide, entire along the margin, glabrescent but when young long-pubescent, densely appressed pubescent along the midrib; stipels absent. Racemes axillary from the axil of the middle leaf, usually about 20 cm long including the peduncle, densely 30–40-flowered, glabrescent on peduncles but densely yellowish pubescent on inflorescence-rachis in flower and glabrescent in fruit. Bracts narrowly triangular (72–73), 6–8 mm long and up to 1 mm wide at the base, pubescent outside. Pedicels 2–3 mm long in flower and 3–4 mm long in fruit, pubescent but later less hairy. Flowers patent or a little pendulous. Bracteoles subulate (72), 4–5 mm long and up to about 0.5 mm wide at the base, sparsely pubescent. Calyx about 10 mm long, densely pubescent outside in flower, 5-lobed above the middle; lobes narrowly triangular (73), lateral ones 4.5–6 mm long, longer than the other lobes or as long as the lower

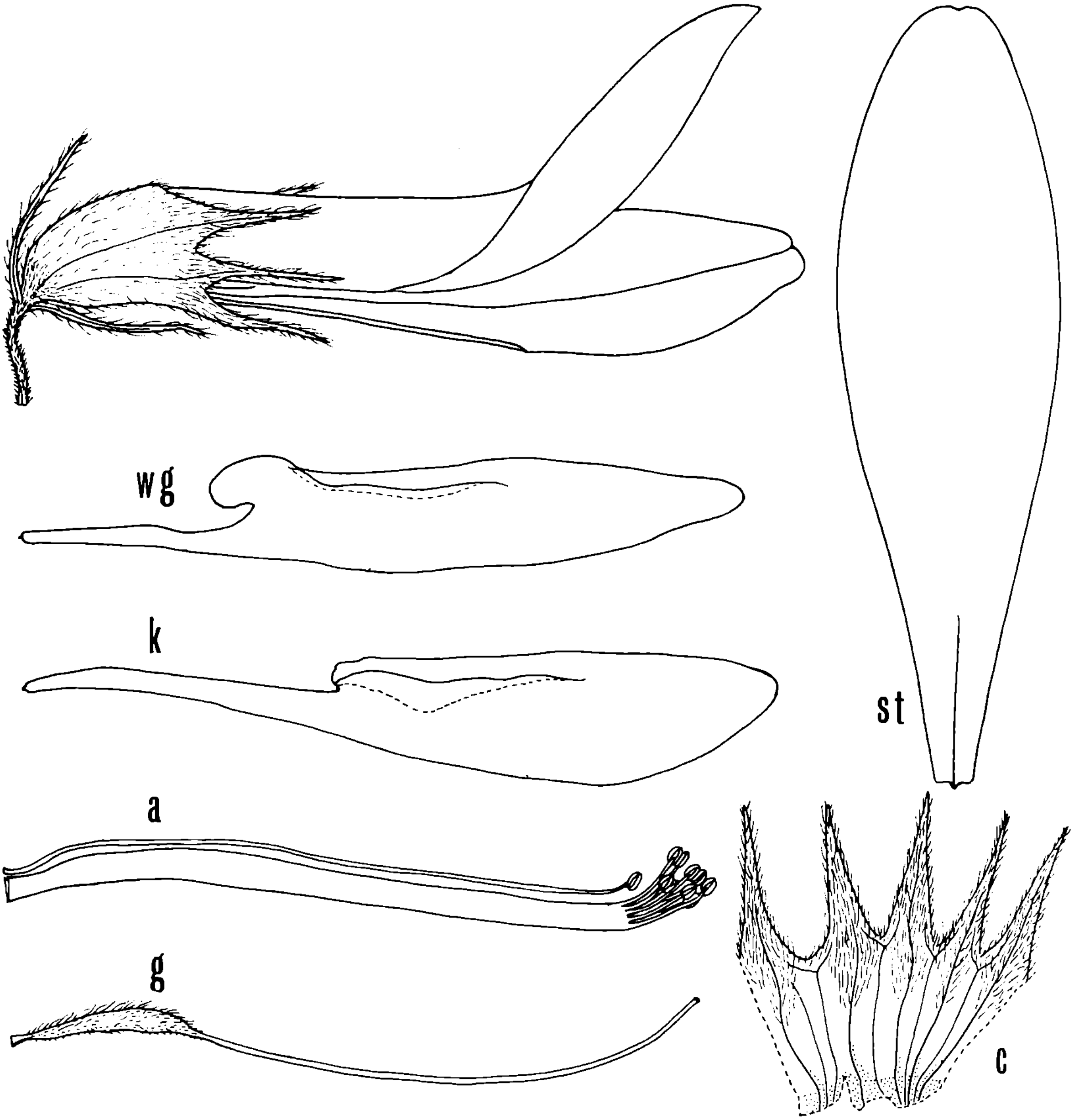

Fig. 57. Flower of *Hedysarum cachemirianum*. c. Calyx, st. Standard, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All ×4. From T. A. Rao 9552.

lobe, upper lobes about 4.5 mm long, shorter than the others. Corolla purple-red; standard nearly equalling or a little longer than the other petals, keel-petals longer than the wings. Standard narrowly obovate (46), slightly retuse or obtuse at the apex, 24–26 mm long and 7–8.5 mm wide, glabrous; wings 22–24 mm long including the claw, 3.5–4 mm wide, the lamina narrowly ovate (37), 16–17 mm long, shortly auriculate at the base, obtuse at the apex, the claw about 7 mm long; keel-petals 23–25 mm long including the claw, 4–5 mm wide, the lamina nearly elliptic (2), obtuse at the apex, 13–15 mm long, the claw about 10 mm long. Androecia diadelphous, vexillar stamen 19–20 mm long, usually about

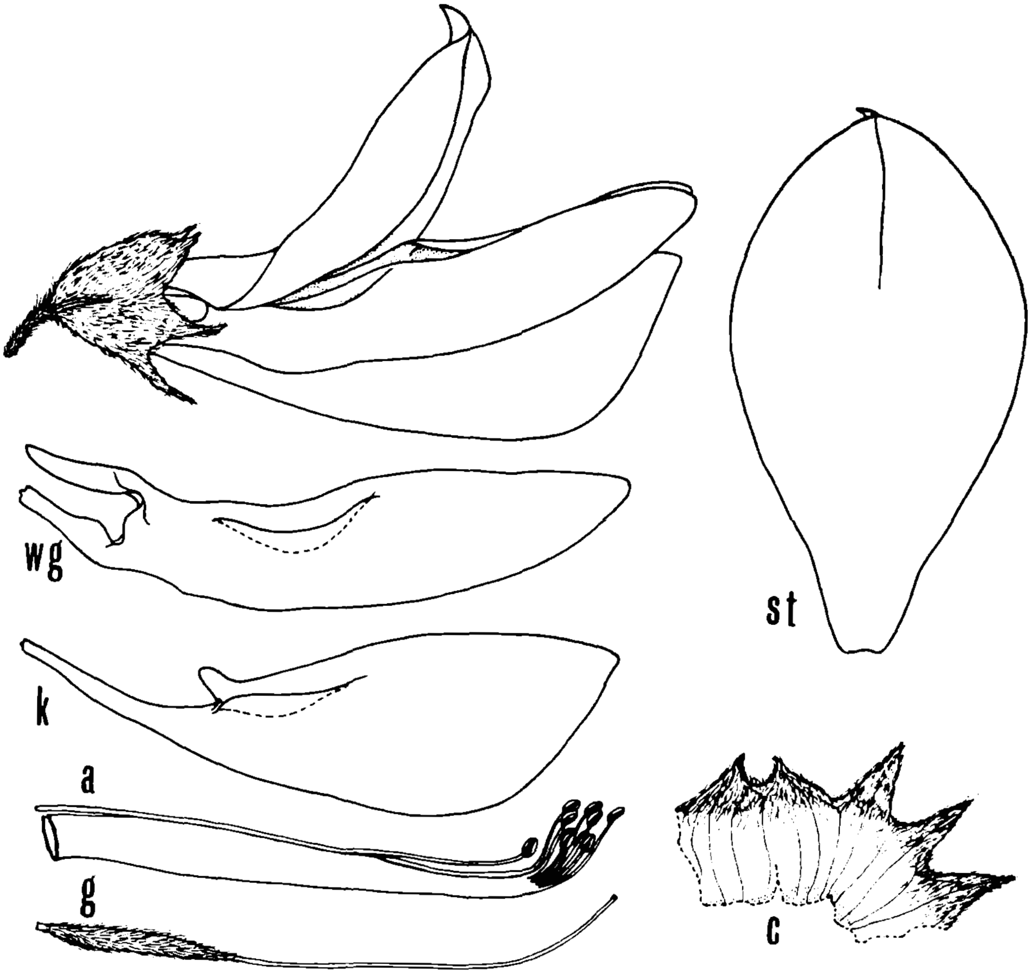

Fig. 58. Flower of *Hedysarum campylocarpon*. c. Calyx, st. Standard, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All×4. From Kanai & Shakya 676163.

3 mm shorter than the longest one of the other stamens. Gynoecia stiped (the stipes about 1 mm long), 22–23 mm long, the ovary 2–3-ovuled, 4.5–5 mm long, densely minute pubescent, the style 16–17 mm long, glabrous. Pods (Fig. 70a) patent or pendulous, (1–)2–3-jointed, up to 5.5 cm long, distinctly stipitate (the stipes 7–11 mm long), with sparsely appressed minute hairs, with clear reticulation on both surfaces, both sutures with distinct wings, wings up to 1 mm broad and almost entire; articles broadly elliptic (5), obovate (47) or ovate (38), 1.3–2 cm long and about 1 cm wide. Seeds (Fig. 71a) about 6×4.5×1.5 mm in size.

Distr. Kashmir (Fig. 55).

Specimens examined: KASHMIR. Kolohoi Valley, 12000 ft., earthy north facing slopes (O. Polunin 56/566 BM); Thajwas, 3800 m (T. A. Rao 9552 TI).

Hedysarum cachemirianum and *H. Falconeri* are similar to each other in having long calyx-lobes, keel-petals nearly equalling the standard and not elongated auricles of wings. However, the former differs clearly from the latter by the longer wings nearly equalling the keel-petals, tubular calyx and almost entire margin of the loment-wings against wings distinctly shorter than the keel-petals, campanulate clayx and erose-dentate margin of the loment-wings in *H. Falconeri.*

4) **Hedysarum campylocarpon** Ohashi in Journ. Jap. Bot. **49**: 164 (1974). [Pl. 12b. Figs. 58, 70f, 71d]

A perennial, 30–90 cm high. Stem erect, robust, about 5 mm thick near the base, white-tomentose at first but nearly glabrescent. Stipules leaf-opposite, connate, membranaceous, simple at the apex, usually 1–2 cm long, glabrous inside, pubescent outside but later glabrescent. Leaves alternate, usually 15–20 cm long including the petiole, leaf-rachis white-woolly; leaflets alternate or opposite, 17–21 i.e. 8–10 pairs, narrowly ovate (37–38) or sometimes narrowly elliptic (3), acute or obtuse at the apex, usually 1.5–4 cm long and 0.7–1.8 cm wide, with sparsely to densely appressed white silky hairs on both surfaces, entire along the margin; stipels not present. Inflorescences axillary, usually 12–20 cm long, usually 20–30-flowered, inflorescence-rachis white-woolly at first but later less hairy; peduncles 4–10 cm long. Bracts narrowly ovate (37–38) or ovate (39) or cymbiformis, 3–10.5 mm long and 1.5–2.5 mm wide, acuminate at the apex, pubescent outside; pedicels 3–5 mm long, densely pubescent, ascending or patent in flower but curved downwards in furit; bracteoles narrowly ovate, 3–4 mm long, about 1 mm wide, pubescent outside. Calyx 4–6 mm long, uniformly with dense minute hairs outside and on the lobes inside, 4-lobed above the middle; tube 3–3.5 mm long, distinctly longer than the lobes; upper lobes shorter than the other lobes, 1–2 mm long, 2-toothed at the apex (teeth 0.5–1.3 mm long), lateral and lower lobes almost equal in shape and size or the former a little shorter than the latter, triangular (75–76), 1.2–2.5 mm long, 1.5–2 mm wide at the base. Corolla magenta or purplish, wings almost equal to or longer than the keel-petals, standard shorter than the keel-petals; standard elliptic (3), rounded or acute at the apex, 15.5–17 mm long, 7.5–9 mm wide, glabrous; wings clawed more or less incurved, 17.5–19 mm long, the lamina narrowly oblong (14), 3–5 mm wide, obtuse at the apex, auriculate at the base, the auricles 3.5–4.3 mm long, coherent at the apex, the claw 3.5–4.3 mm long; keel-petals long-clawed, incurved, 17–18 mm long, the lamina nearly obovate, acute at the apex, auriculate at the base, 4.5–5.5 mm wide, the claw 5.6–6.5 mm long. Androecia diadelphous, vexillar stamen free from or sometimes partly adherent to the others near the middle, 13.5–16 mm long, the longest one among connate stamens 17–20 mm long, usually 3–4 mm longer than the vexillar one. Gynoecia 17–21 mm long, shortly stiped, the stipe 0.5–1 mm long, the ovary narrowly elliptic, 6–8 mm long, 2–3(–4)-ovuled, with densely appressed minute hairs, the style 10–14 mm long, glabrous. Pods (Fig. 70f) pendulous, 2–3 (–4)-jointed, 2.5–4 cm long, distinctly stiped, with appressed minute hairs but afterwards glabrescent, both sutures apparently margined, the margin irregularly crenulate to toothed; articles narrowly obovate (47), oblong (16) or elliptic (4), 8–12 mm long, 6–7 mm wide, reticulate-veined. Seeds (Fig. 71d) usually 4.3–4.7 × 3.3–3.5 mm in size.

Distr. Central Nepal (Fig. 59).

Specimens examined: Nepal. Chilime Kharka, 13500 ft., stream side, fls. purple (Polunin 1226, Jul. 1949, bm–Holotype, ti–Isotype); Kyangchin Gompa, Lat. 28°13′N, Long. 85°44′E, 4100 m (Dobremez 1073 gr); Serwotche, Langtang valley, 4000 m, sur moraines, avec *Salix daltoniana* (A. Maire 584 GR); Likhoo Shailoong, 14–15000 ft. (Dhwoj 0408 BM); Kyangin Kharka, 11–12000 ft. (S. B. Malla 9195 BM); Langtang, 12000 ft. (Polunin 562 BM, TI); Shiar Khola, 9500 ft. (Gardner in 1953 BM); Langtang-Kyangjing, 3400–3800 m (Kanai & Shakya 676163 TI).

5) **Hedysarum Falconeri** Baker in Fl. Brit. Ind. **2**: 146 (1876).

[Pl. 13e. Figs. 60, 70h]

H. obscurum L. var. *Falconeri* (Baker) B. Fedtsch. in Act. Hort. Petrop. **19**: 243 (1902)-Kitamura in Results Kyoto Univ. Sci. Exp. Karakoram Hindukush **3**: 92 (1964).

H. obscurum L. var. *affghanicum* B. Fedtsch., l.c. 243 (1902).

A perennial, 45–60 cm high; stems erect, more or less pubescent with appressed white hairs (about 0.5 mm long). Stipules leaf-opposite, membranaceous, connate, usually early deciduous, 1–1.5 cm long, nearly glabrous. Leaves alternate, usually (10–)15–20(–23) cm long, hairy like the stem along the rachis; leaflets opposite or occasionally alternate near the base, (5–)7–10(–13) pairs, elliptic (3–4) or ovate (38–39) or occasionally narrowly elliptic (2), obtuse to acute and mucronulate at the apex, 15–30 mm long, 6–15 mm broad, entire along the margin, glabrous or sparsely pubescent with appressed white hairs above, sparsely to rather densely pubescent below, lateral veins rather prominent on both surfaces. Racemes usually 20–30(–45)-flowered, 10–40 cm long including the peduncle, with sparse to rather dense hairs like the stem; pedicels (2–)3–5 mm long, densely pubescent with appressed or ascending white hairs (less than 0.5 mm long). Bracts subulate (72) to narrowly triangular (73), 3–10 mm long, 0.5 mm wide, almost glabrous to rather densely pubescent outside. Bracteoles subulate (72) to narrowly triangular (73), 2–5 mm long, about 0.3 mm wide, ciliate, nearly glabrous to pubescent outside. Calyx 7–9 mm long, white-pubescent or rarely almost glabrous outside, rather densely appressed minute puberulent on the lobes inside, 5-lobed; tube 2.5–3.5 mm long, apparently shorter than the lobes; calyx-lobes with conspicuous long-cuspidate apex, upper lobes 4–5 mm long, lateral and lower lobes nearly subulate (72) to narrowly triangular (73), 5–6 mm long. Corolla purple to violet;

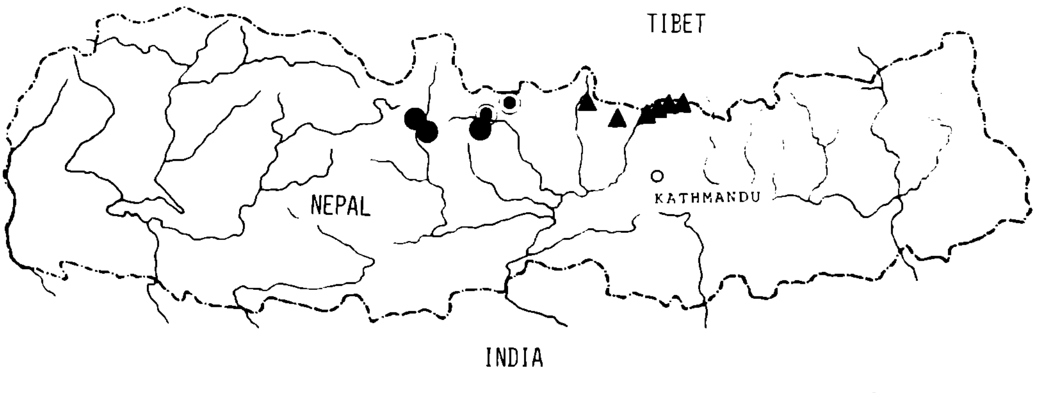

Fig. 59. Distribution of *Hedysarum manaslense* (⊙: var. *manaslense*, ●: var. *nepalense*) and *H. campylocarpon* (▲).

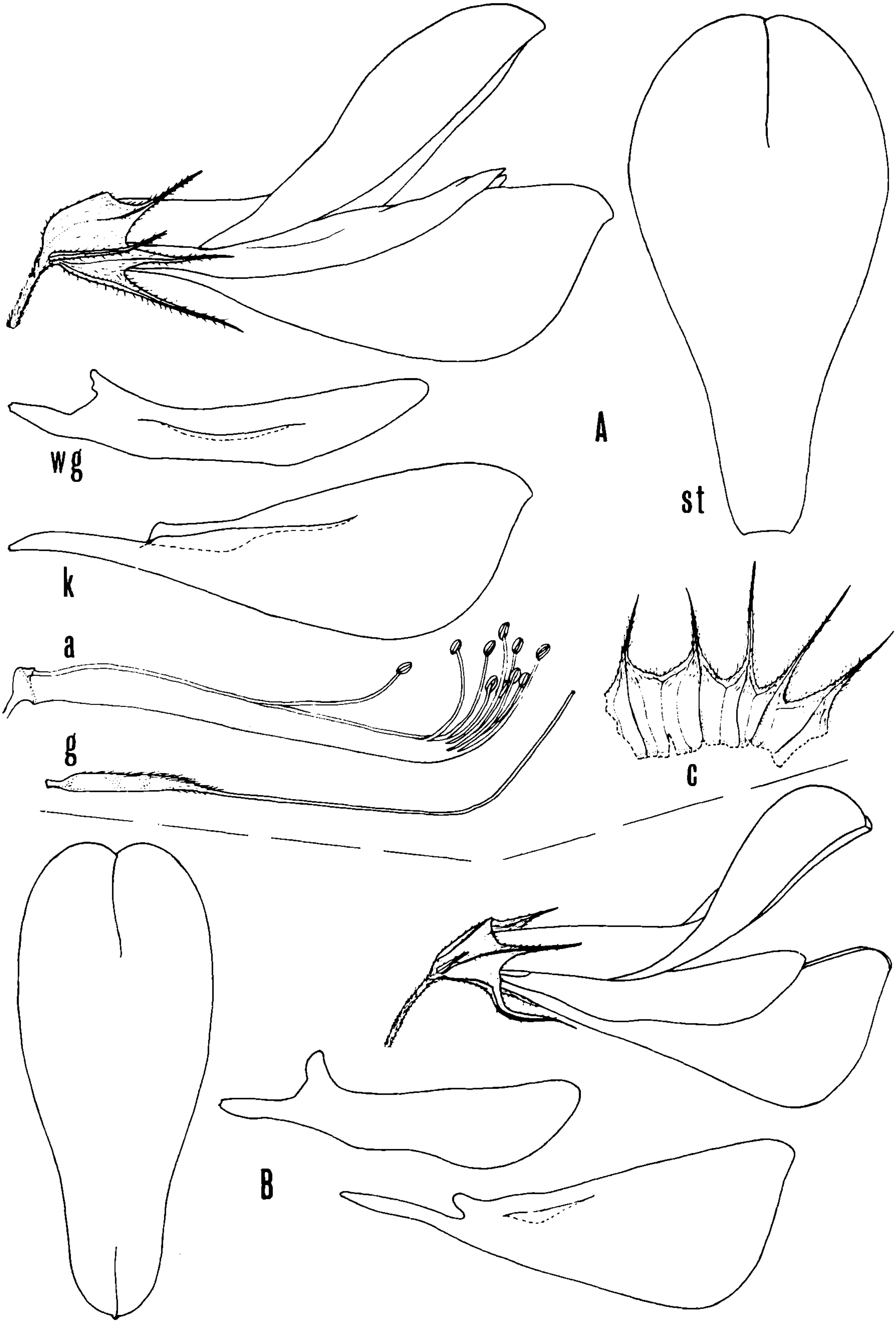

Fig. 60. Flowers of *Hedysarum Falconeri*. c. Calyx from inside, st. Standard, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All ×4. A from Inayat 25563, B from the lectotype.

keel-petals as long as the standard or occasionally a little shorter than the standard, wings distinctly shorter than the other petals. Standard narrowly obovate (46) to obovate (47), emarginate at the apex, 17–20 mm long and 7–10 mm wide, glabrous; wings 13–16 mm long including the claw (claw 3-3.5 mm long), the lamina narrowly elliptic (1), 3–3.5 mm wide, shortly auriculate, obtuse at the apex; keel-petals 17–20 mm long includig the claw (claw 4.5–5.5 mm long), the lamina 5–6 mm wide, obtuse or acute at the apex, auriculate at the base. Androecia diadelphous, vexillar stamen 12–14 mm long, usually 6–7 mm shorter than the longest one of the other stamens. Gynoecia 19–22 mm long, minutely stiped (the stipe about 0.5 mm long), the ovary usually 2(–3)-ovuled, 4.5–5 mm long, minutely appressed pubescent, the style 13.5–16 mm long, glabrous. Pods (Fig. 70h) 1–3-jointed, stiped (the stipe 3–4 mm long), rather densely appressed pubescent, reticulate-nerved on both surfaces, both sutures with distinct wings, wings about 1 mm broad and irregularly erose-dentate along the margin; articles broadly elliptic (5) to nearly orbicular (6), 10–13 mm long and 8–10 mm wide.

Distr. N. Afghanistan, Karakoram, Himalaya, and W. Tibet (Fig. 55).

Specimens examined: AFGHANISTAN. Kurrum Valley, Shendtoi, 10000 ft. (Aitchison 786 K–Syntype of *H. obscurum* var. *affghanicum*). KARAKORAM. Charesa Glacier, 12000 ft., terminal moraine, sheltered area, locally dominant, fls. rose purple, 1.5 ft. high (O. Polunin 6096 BM); Hispar Glacier, left bank, Chokutens, 11000 ft. (R. Scott Russell 1205 BM); Barpu Glacier, left bank, 12500 ft., broken rock, valley side (R. Scott Russell 1109 BM, TI); Solu Glacier, R. bank, 12500 ft. (R. Scott Russell 1737 BM); South facing slope about 4 miles north west of Hispar Village, Nagar State, 11000 ft., dry stony and scree places, fls. rosy purple, 3 ft. (O. Polunin 6337 BM). KASHMIR. Chitral (A. Barrett s.n. K); Chitral, Madaglast, 10500–11500 ft. (S. M. Toppin 494 K); Chitral State, E. side of Barum South Glacier, 10500 ft. (B. K. Porter A6 K); Rana Valley, S. W. of Astor Gilgit Agency, 35°20′N, 75°50′E, stony glacial moraine among scattered pines, 11500 ft. (Lankester & Pearson TEL1278 BM); Upper Satpura, Baltistan (Sidigi, Nasir & Ali 4129 K); Kashmir, Godai (Inayat 25563 K); Kashmir, 10-12000 ft. (Giles 613 K); loc. cit., 8300 ft. (Giles 149 K); Gilgit (Tanner 146 K). WEST TIBET. Common up to near foot of Baltora Glacier (Conway 5 K); Exact locality unknown (Falconer 441 K–Lectotype).

Hedysarum Falconeri is similar to *H. cachemirianum* and *H. astragaloides*. The flowers of *H. Falconeri* are very similar to those of *H. astragaloides*, but the former differs from the latter in 1) the colour of collora, i.e., purple to violet in *H. Falconeri* against yellowish in *H. astragaloides*, 2) relative length between the keel-petals and the standard, i.e., standard is as long as the keel-petals in *H. Falconeri* against standard is shorter than the keel-petals in *H. astragaloides*, and 3) relative length of the auricle and the claw of wings, i.e., the auricle is shorter than the claw in *H. Falconeri* against both are nearly equal in *H. astragaloides*.

6) **Hedysarum kumaonense** Benth. ex Baker in Fl. Brit. Ind. **2**: 145 (1876)–B. Fedtsch. in Act. Hort. Petrop. **19**: 311 (1902). [Pl. 13f. Figs. 61, 70e, 71e]

A perennial herb, decumbent to subdecumbent, almost acaulescent, stem less than 5 cm long, internodes usually concealed by the stipule. Stipules leaf-

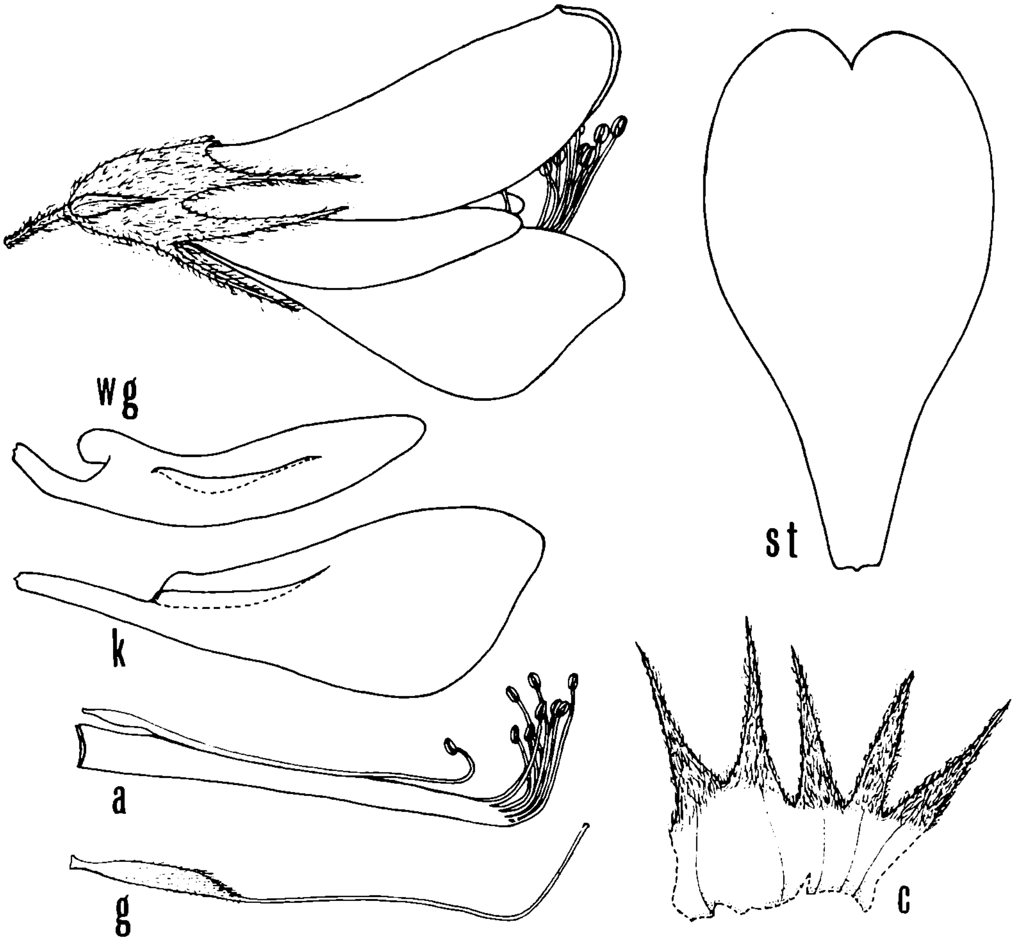

Fig. 61. Flower of *Hedysarum kumaonense*. c. Calyx, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All ×4. From Stainton, Sykes & Williams 856.

opposite, scariose, more or less brown, connate, bifide at the apex, 0.5–2 cm long, densely to sparsely white-pubescent outside. Leaves alternate, 5–32 cm long including the petiole, leaf-rachis sparsely to densely white-pubescent; petioles 0.5–7 cm long; leaflets usually opposite, (13–)17–31(–33) i.e. (6–)8–15(–16) pairs, obovate (47–48) to broadly obovate (49) or sometimes elliptic (3–4) to broadly elliptic (5), retuse to emarginate at the apex, obtuse at the base, (2–)5–15(–18) mm long and (1–)4–11(–14) mm wide, glabrous or sparsely to densely white-pubescent and densely with minute dark dots above, densely white-pubescent and with minute light-coloured dots below, entire along the margin, with minute hair-like appendages at the base of petiolule, stipels absent. Racemes axillary, 4–35 cm long including the peduncle, densely to sparsely white-pubescent along inflorescence-rachis; peduncles (3–)5–30 cm long, sparsely to densely white-pubescent; flowers dense but rarely rather lax, 8–35-flowered per raceme, patent. Bracts narrowly ovate (36–37) to ovate (38), 4–8(–10) mm long and 1–3.5 mm wide, white-pubescent outside, ciliate. Pedicels 1.5–3.5 mm long in flower, densely pubescent. Bracteoles narrowly ovate (36–37), 2.5–3.5 mm long and 0.5–1 mm wide, pubescent outside, ciliate. Calyx 6.5–8(–10) mm long, densely pubescent, 5-lobed; lobes narrowly triangular (73–74), upper 2-lobes 4–5.5(–7) mm long, longer than or as long as the lateral lobes, lower lobes 4–5(–6) mm long, shortest or nearly equal to the other lobes. Corolla red, purplish red or pink; standard and keel-petals nearly equal, wings shortest. Standard obovate (47–48), emarginate at the apex, 13.5–16 mm long and (7–)8–8.5 mm wide, glabrous; wings 10.5–13.5 mm long including the claw (claws 2.5–3.5 mm long) and 2–3 mm wide, the lamina narrowly ovate (37), shortly auriculate at the base (auricles ovate or elliptic, 1–1.5 mm long), obtuse at the apex; keel-petals 14.5–15.5 mm long including the claw (claws 3.5–4.5 mm long), 4.5–5.5 mm wide, the lamina obtuse at the apex, shortly auriculate at the base. Androecia diadelphous but vexillar stamen occasionally adherent partly to the other stamens near the middle, vexillar stamen 12–13 mm long, (2–)3–4 mm shorter than the longest one of the other stamens. Gynoecia sessile or short-stiped (the stipes less than 0.5 mm long), 14.5–18 mm long, the ovary 2–3-ovuled, 3.5–5 mm long, densely short-appressed-pubescent, the style 10.5–13 mm long, glabrous. Pods (Fig. 70e) 1–2-jointed, shortly stipitate (the stipes about 1 mm long), with sparsely appressed minute hairs, reticulate-nerved on both surfaces, without wings; articles elliptic (4), 8–9 mm long and 6–7 mm wide. Seeds (Fig. 71e) about 4.5 × 3.5 × 1.5 mm in size.

Distr. Himalaya from Kumaon to Tibet and Central Nepal (Fig. 62).

Specimens examined: NEPAL. Phoksumdotal, 29°05′N, 82°57′E, 12500 ft., on dry stony slopes (Stainton 4298 BM, TI); Suligad, 9000 ft., open grassy slope (T. B. Shrestha 5273 KATM, TI); Rohagaon, Suligad, 10000 ft., grass slopes, fls. rose, and undersides of leaves rather silvery (Polunin, Sykes & Williams 2182 BM, TI); loc. cit., 11000 ft., open stony slopes, petals red (Polunin, Sykes & Williams 3381 BM, TI); Barbung Khola, Kakkotgaon, 12000 ft., on dry stony slopes, fls. bright dark pink (Polunin, Sykes & Williams 1097 BM, TI); Kharpu–Durpa, Humla Karnali, 8000 ft., dry grass slopes, corolla dirty cream with red markings (Polunin, Sykes & Williams 4305 BM, TI); Lulo Khola, 15000 ft., on open sunny slopes (Polunin, Sykes & Williams 3480 BM); Purana Mugu–Tankia, Mugu Khola, 13000 ft., open stony slopes (Polunin, Sykes & Williams 5323 BM, TI); Chairogaon, N. of Tukucha, 11000 ft., on open grass slopes (Stainton, Sykes & Williams 774 BM, TI); loc. cit., on open slopes (Stainton, Sykes & Williams 856 BM, TI); Tukucha, 9500 ft., beneath conifers on hillside (Stainton, Sykes & Williams 803 BM, TI); Tukucha, Kali Gandaki, 11000 ft., open grass slopes (Stainton, Sykes & Williams 1927 BM,

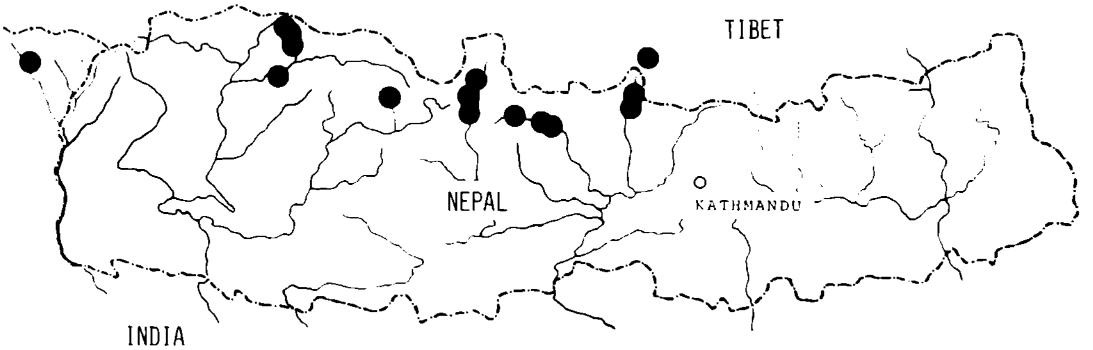

Fig. 62. Distribution of *Hedysarum kumaonense* in Nepal.

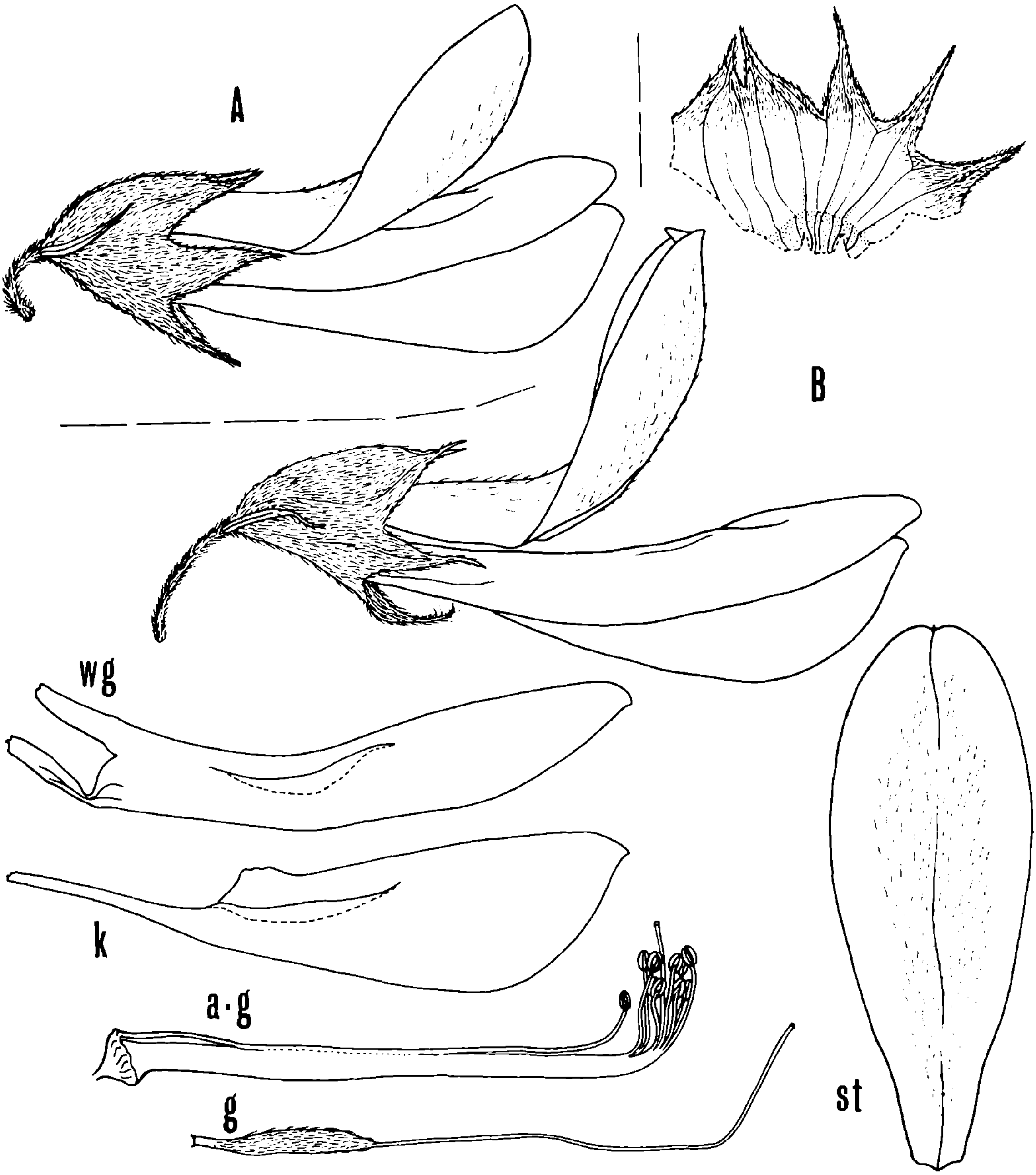

Fig. 63. Flowers of *Hedysarum manaslense*. st. Standard, wg. Wing, k. Keel-petal, a·g. Androecium and gynoecium, g. Gynoecium. All ×4. A from S. Nakao, 7 June 1953 (Isotype of *Astragalus manaslensis*), B from D. G. Lowndes 1474 (Isotype of *H. nepalense* var. *subhirtellum*).

TI); Tat Pani–Pisang, 2900 m (S. Nakao s.n. KYO, TI); Manany, 15000 ft. (K. N. Shrma E43 BM); Marsiandi Valley, 11500 ft., on open dry hillsides (D. G. Lowndes L.1000 BM); Marsiandi Valley, 8600 ft., a single plant on shingle slides, flowers bright rose-pink, leaves grey-green (Lowndes 910 BM); Shiar Khola, Thaple La, 8000 ft ?, high alpine scree slope (P.C. Gardner 1605 BM); Shiar Khola, near Tumjl, 8500 ft., open bouldery ground (P. C. Gardner 834A BM). TIBET. Track to Thaple La, 13000 ft., grassland on soil bank, flowers red purple (P. C.

Gardner 703 BM).

7) **Hedysarum manaslense** (Kitamura) Ohashi in Journ. Jap. Bot. **50**: 23 (1975). [Pl. 13h. Figs. 63, 70c, 71f]

Astragalus manaslensis Kitamura in Kihara, Peoples Nepal Himal. 422 (1957).

H. nepalense Ohashi var. *subhirtellum* Ohashi in Journ. Jap. Bot. **49**: 164 (1974).

A perennial, 30–150 cm high. Stems robust, (3–)5–7 mm thick near the base, densely white-tomentose at first but afterwards become less hairy. Stipules leaf-opposite, membranaceous, connate, simple at the apex, up to 2 cm long, glabrous inside, pubescent outside but later glabrescent. Leaves alternate, usually 15–20 cm long including the petiole, leaf-rachis white-tomentose at first; petioles usually 1.5–2.5 cm long; leaflets generally opposite, (15–)17–21(–23) i.e. (7–)8–10(–11) pairs, narrowly ovate (37–38) or narrowly elliptic (2–3), acute to obtuse at the apex, usually 3–6 cm long and 1–2 cm wide, sparsely pubescent above, tomentose beneath, entire along the margin; stipels not present. Inflorescences axillary, up to 20 cm long including the peduncle, usually 20–30-flowered, peduncles and inflorescence-rachis tomentose but later glabrescent. Bracts membranaceous, cymbiformis or narrowly ovate (36–37), acuminate at the apex, 6–11 mm long, 1.5–2 mm wide, sparsely pubescent outside, glabrous inside. Pedicels 3–5 mm long, with densely ascending hairs in flower. Bracteoles narrowly ovate (36), acuminate at the apex, 2.5–5.5 mm long, 0.3–0.8 mm wide, hairy like the bract. Calyx 7–8 mm long, densely minute-pubescent, 4-lobed above the middle; tube more or less longer than the lobes, 3.5–4.5 mm long; upper lobes shorter than the other lobes, transversely broadly triangular, 2–3.5 mm long, 4–6 mm wide at the base, 2-toothed at the apex (the teeth 1.5–2.5 mm long), lateral and lower lobes narrowly triangular (73), 3–4 mm long, 1.5–2 mm wide at the base. Corolla pink to bright purplish pink; wings longer than the other petals, keel-petals longer than the standard, or occasionally all the petals nearly equal. Standard obovate (47), rounded or apiculate, 15.5–19 mm long, 6–9 mm wide, with minute white hairs on both surfaces; wings narrowlly elliptic (2), 16.5–23.5 mm long including the claw, 2.5–4.5 mm wide, the lamina obtuse at the apex, distinctly auriculate near the base, the auricles 3–4 mm long, the claw 3–5 mm long; keel-petals 16.5–20 mm long including the claw, 4–6 mm wide, the lamina acute, obtuse or apiculate at the apex, auriculate at the base, the claw 6–7 mm long. Androecia diadelphous, vexillar stamen occasionally adherent partly to the other stamens, 14–18.5 mm long, other 9 stamens connate, 16–21 mm long, the longest one usually about 3 mm longer than the vexillar one. Gynoecia stiped, 17–22 mm long, the ovary 2–3(–4)-ovuled, 4.5–7 mm long, densely minute-pubescent, the style 11–15 mm long. Pods (Fig. 70c) ascending, 2–3(–4)-jointed, 2.5–3.5(–4) cm long, distinctly stipitate, appressed minute hairy or glabrescent, both sutures a little margined, the margin entire; articles narrowly obovate (47), 7–10(–13) mm long, 4–6 mm wide, more or less reticulate-veined. Seeds (Fig. 71f) about 4.5 × 3.5 mm in size.

7-i) Var. **manaslense**.

Distr. Central Nepal (Fig. 59).

Specimens examined: NEPAL. Bimtakothi, 13500 ft. (Lowndes 1474 BM–Holotype of *H. nepalense* var. *subhirtellum* and TI–Isotype); Manaslu (S. Nakao, 7 Jun.

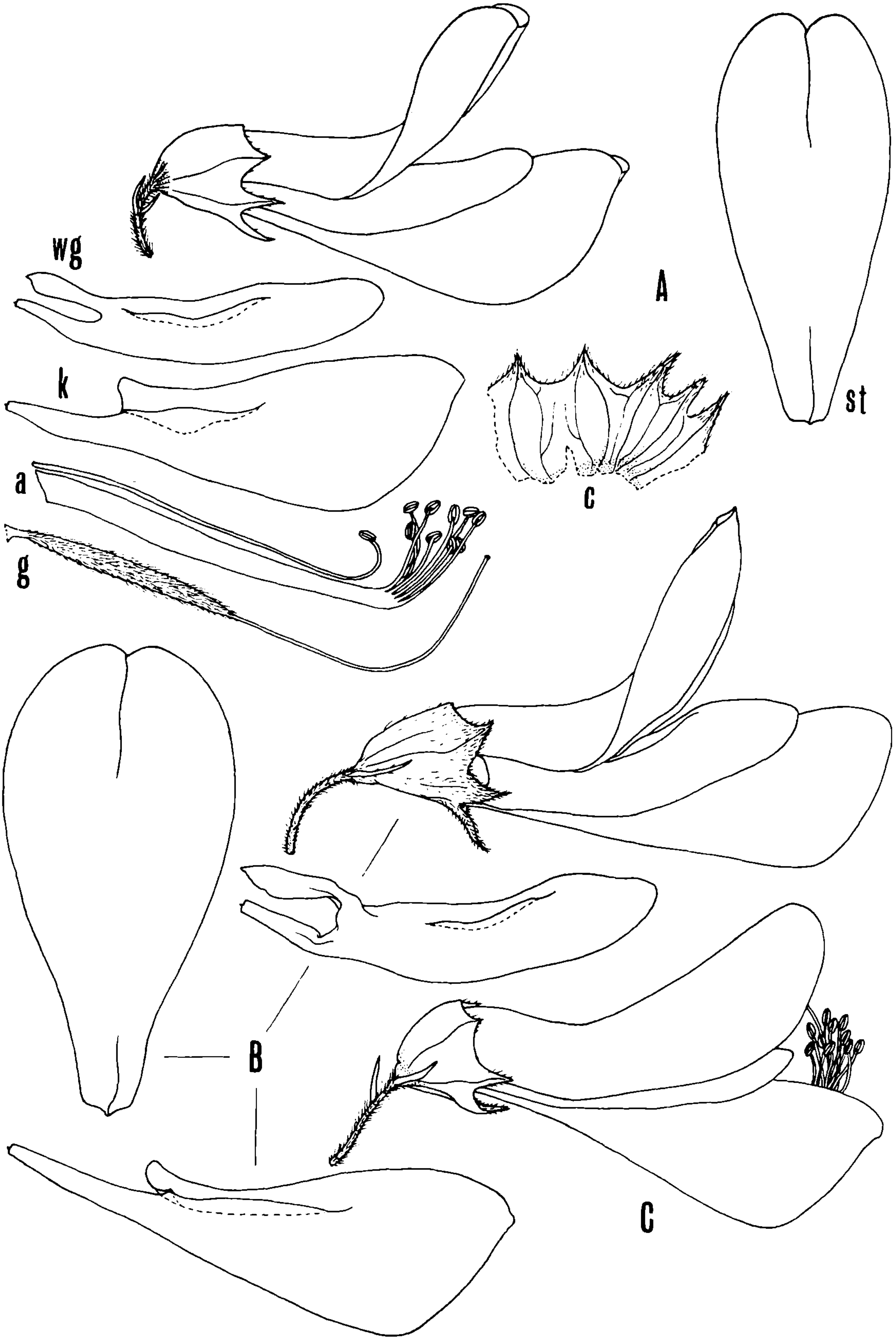

Fig. 64. Flowers of *Hedysarum microcalyx*. c. Calyx, st. Standard, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All ×4. A from G. Sherriff 7453, B from J. R. Drummond 23750, C from Lance s.n. (Syntype of *H. microcalyx*).

1953 TI–Isotype of *Astragalus manaslensis*).

7-ii) Var. **nepalense** (Ohashi) Ohashi in Journ. Jap. Bot. **50**: 23 (1975).

Hedysarum nepalense Ohashi in Journ. Jap. Bot. **49**: 162 (1974).

Distr. Central Nepal (Fig. 59).

Specimens examined: NEPAL. Tukucha, Kali Gandaki, 10000 ft. (Stainton, Sykes & Williams 1080 BM–Holotype of *H. nepalense* and TI–Isotype; Stainton, Sykes & Williams 7394 BM, TI; Stainton, Sykes & Williams 7853 BM, TI; Stainton, Sykes & Williams 7995 BM, TI); Taglung, S. of Tukucha, 10000 ft. (Stainton, Sykes & Williams 1698 BM, TI); Marsiandi Valley, 11500 ft. (Lowndes 1065 BM, TI).

8) **Hedysarum microcalyx** Baker in Fl. Brit. Ind. **2**: 147 (1876)–B. Fedtsch. in Act. Hort. Petrop. **19**: 245 (1902)–Ohashi in Journ. Jap. Bot. **49**: 161 (1974).
[Pl. 12c. Figs. 64, 70b]

A robust perennial herb, branched at the top of woody rhizome. Stems erect, up to about 100 cm high, glabrous. Stipules membranaceous, connate along the whole margin, sheathing entirely young leaves and inflorescences, 3–5 cm long, glabrous on both sides. Leaves 3–4(–5)-whorled, 10–25 cm long, glabrous; petioles usually 2–3 cm long; leaflets more or less opposite, (13–)15–17(–19) i.e. (6–)7–8(–9) pairs, narrowly ovate to ovate (37–38) or elliptic (3), acute to obtuse at the apex, obtuse at the base, (20–)25–35(–50) mm long and (7–)10–15(–20) mm wide, glabrescent on both surfaces; stipels absent. Racemes axillary, (5–)10–20 cm long including the peduncle, glabrous or pubescent when young and later glabrescent; (5–)10–30(–35)-flowered per raceme. Bracts narrowly ovate (36–37), (3–)4–6(–8) mm long, glabrous. Pedicels 4–6 mm long, densely pubescent. Bracteoles narrowly ovate (36) to subulate (72), 1–2.5 mm long, attached at the upper part of pedicel. Calyx 3.5–5.5 mm long, almost glabrous, sparsely ciliate along the margin of lobes, 5-lobed, tube 3–4 mm long; lobes apparently shorter than the tube, upper two lobes shallowly triangular, acute at the apex, 0.7–1.5 mm long, lateral and lower lobes longer than the upper ones, triangular (75–76), 1.3–2 mm long. Corolla purple, purplish red or crimson purple; keel-petals longer than the other petals or rarely almost as long as the standard, standard longer than the wings. Standard obovate (47), emarginate at the apex, 14–17 mm long and 6–8 mm wide, glabrous; wings (12–)13–15 mm long and 2.3–3.5 mm wide, auriculate at the base of lamina, claws 2.5–3.5 mm long, auricles usually equal to the claw in length; keel-petals (14.5–)16.5–18 mm long including the claw, the lamina subacute or obtuse at the apex, auriculate at the base, 4.5–6 mm wide, claw 4–5.5 mm long. Androecia diadelphous, vexillar stamen 12–15 mm long, the other 9 connate stamens 15–19 mm long, the longest one about 3 mm longer than the vexillar one. Gynoecia more or less stiped, 19–21 mm long, the ovary 7–8 mm long, glabrous or minutely pubescent, (1–)2–3(–4)-ovuled, the style 10–11.5 mm long, glabrous. Pods (Fig. 70b) (1–)2–3-jointed, long-stipitate (the stipes 4–5 mm long), nearly glabrous or sparsely with minute appressed hairs, reticulate-nerved on both surfaces, both sutures with wings, the wing about 1 mm broad and entire along the margin; articles elliptic (3–4), 8–18 mm long and 5–9 mm wide.

Distr. West Himalaya from Kashmir to Upper Punjab (Fig. 55).

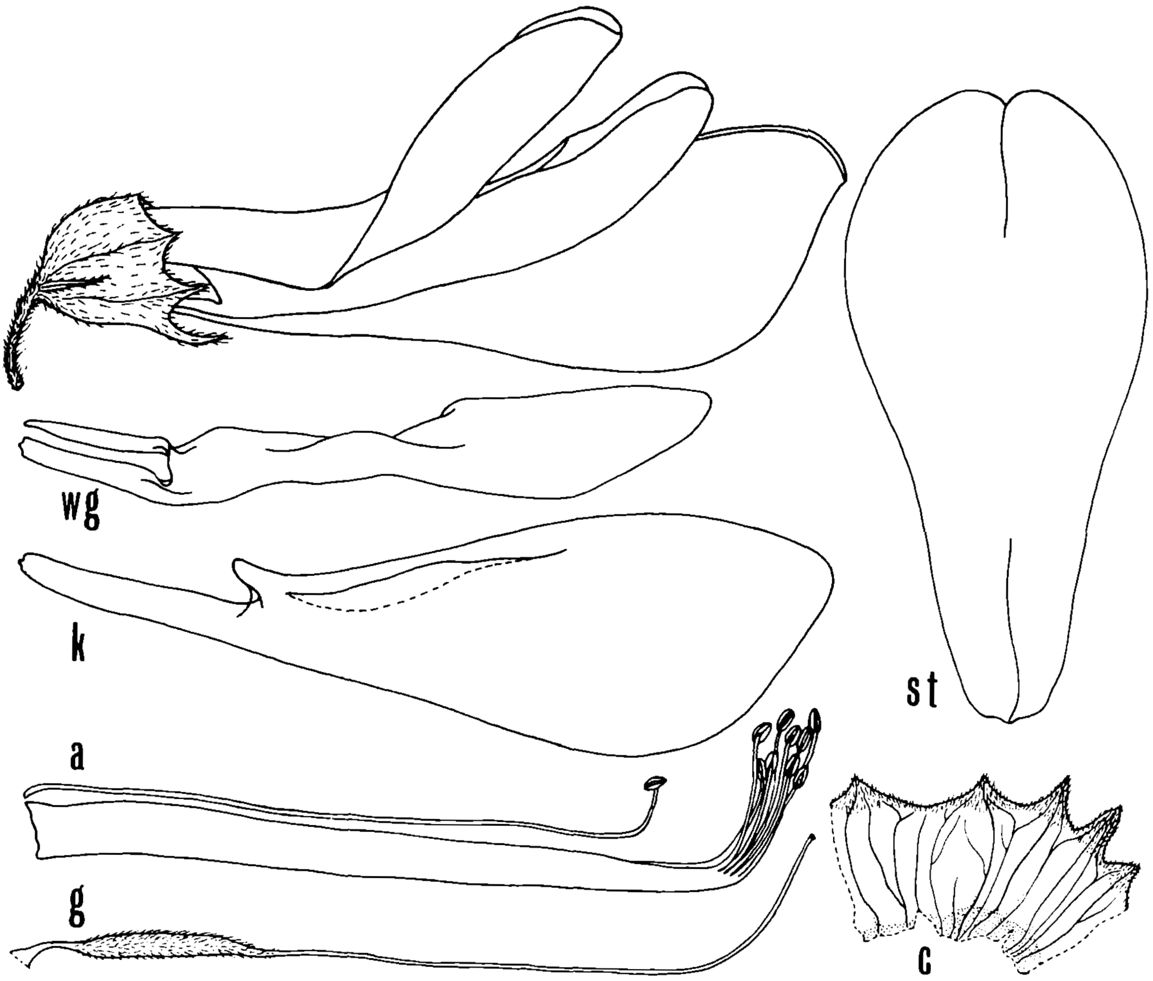

Fig. 65. Flower of the voucher specimen of *Hedysarum microcalyx* illustrated in Botanical Magazine t. 6931 (1887). c. Calyx, st. Standard, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All ×4.

Specimens examined; KASHMIR. Garhwal (Falconer 439 K–Lectotype of *H. microcalyx*); Chenab Valley (Thomson in 1852 K); Ascent to Sauch Pass, 12000 ft., Chenab Valley (R. Sllis 1547 K); Tihri,Garhwal (Duthie 1009 & 1010 K); Kashmir (Lance s.n. K–Syntype of *H. microcalyx*); Bharmaor, Chamba State, on rocks above Rajaor, 10500 ft., fls. purple (Unknown collector s.n. K); Pangi, Chamba State, below Biudratan, 8500 ft. (Duthie s.n. K). PUNJAB. Lahul (H. Jaeschke 235 K–Syntype of *H. microcalyx*); Lahul, Kandang, 10300 ft., a shrub with purple flowers (N. L. Bor 14994 K); Lahul, Sissu, 10000 ft., purple fls. (N. L. Bor 12384 & 10295 K); Lahul, Kyelang–Jespa, 10500 ft., a shrub on steep rocky wet places, flowers purplish red (N. L. Bor 16411 K); Lahul, Gambur, 10200 ft., a herbaceous shrub in shade (N. L. Bor 13199 K); no precise locality (J. R. Drummond 23485, 23750 K); Simla Hill States, Baspa Valley, Lat. 31°23′N, Long. 78°30′E, 14500 ft., on banks of streams, flowers grape purple (G. Sherriff 7453 BM).

We examined the voucher specimen of *Hedysarum microcalyx* illustrated in Botanical Magazine t. 6931 (1887). The plant was cultivated at Kew Garden and collected on 16 June 1886. However, the specimen differs from *H. microcalyx* as follows:

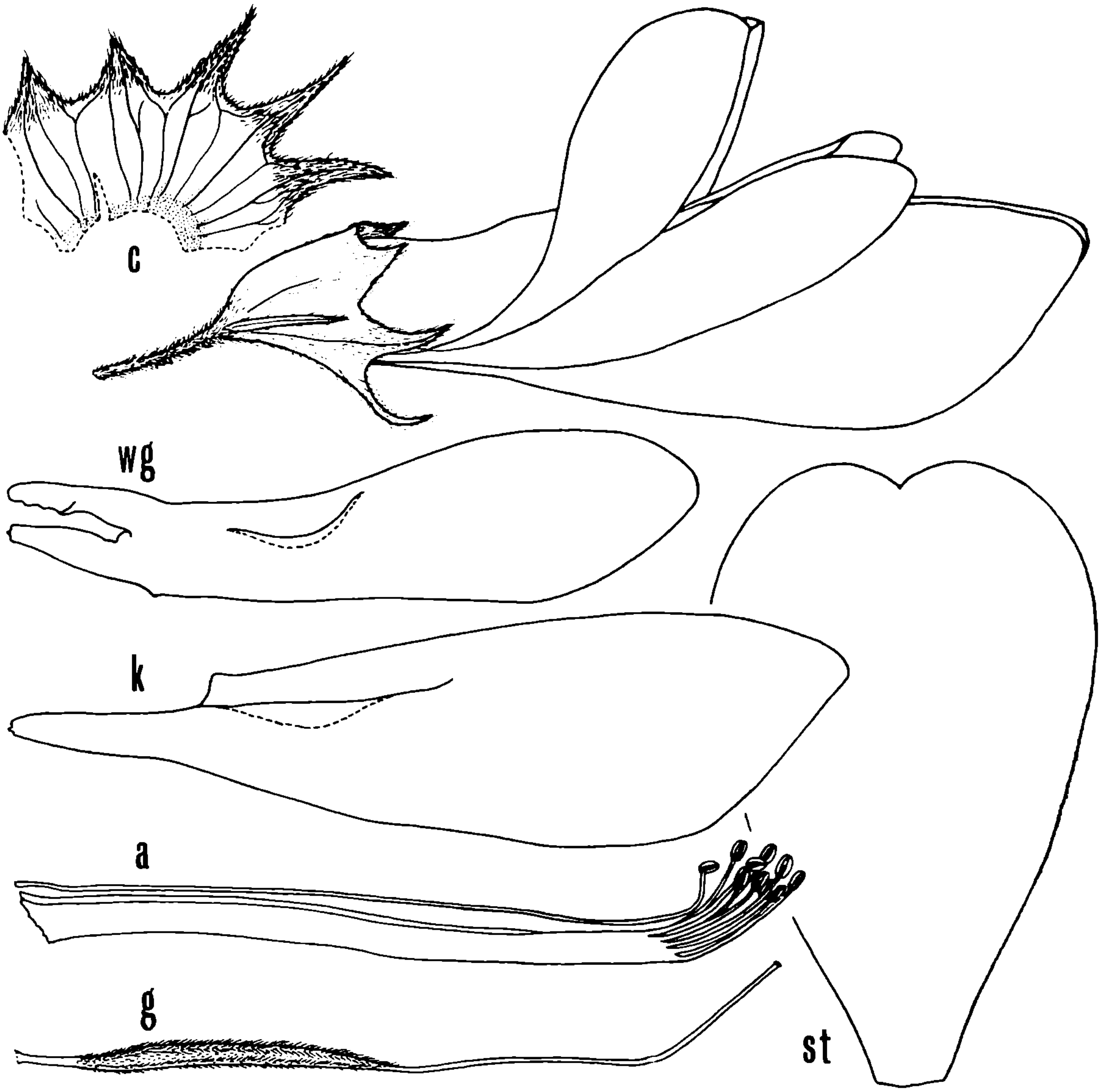

Fig. 66. Flower of *Hedysarum pseudomicrocalyx*. c. Calyx, st. Standard, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All ×4. From the holotype.

	Specimen of Bot. Mag. t. 6931	*H. microcalyx*
Leaves	alternate	whorled
Stipules	connate along the leaf-opposite margin	connate along the whole margin, hence, envelop the bud
Flowers	longer than 20 mm	15–18 mm long
Standards	shorter than the wings	longer than the wings
Ovary	4–5-ovuled	(1–)2–3(–4)-ovuled

The voucher specimen is very similar to *H. alpinum* L. but differs from the species in having bracts which are longer than the pedicel.

9) **Hedysarum pseudomicrocalyx** Ohashi et Tateishi, sp. nov.

[Pl. 14i. Fig. 66]

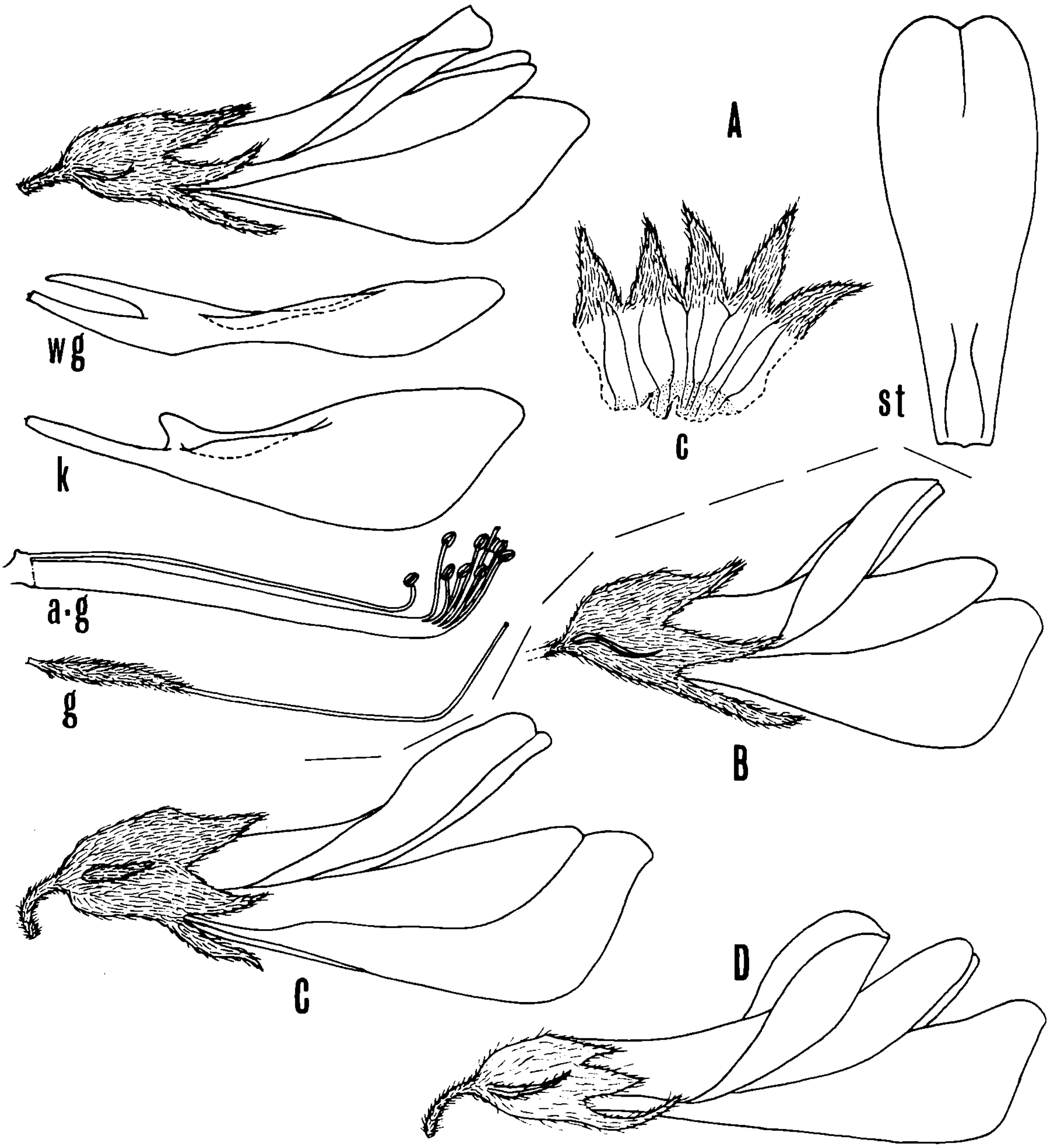

Fig. 67. Flowers of *Hedysarum sikkimense*. c. Calyx, St. Standard, wg. Wing, k. Keel-petal, a·g. Androecium and gynoecium, g. Gynoecium. All ×4. A from J. D. A. Stainton 985 (Nepal), B from J. D. A. Stainton 630 (Nepal), C from Kanai et al. 720706 (Nepal), D from Forrest 30747 (China).

Planta perennis, 40 cm vel ultra alta. Caules erecti, robusti, glabrescentes. Stipulae foliis oppositae connatae, brunneae, membranaceae, juventute gemmam totam vaginantes, ca. 2 cm longae, glabrae. Folia opposita, vulgo (petiolo 1–1.5 cm longs incluso) 8–14 cm longa, rhachi sparsim adpresse pubescentia. Foliola 6–7-juga, generaliter opposita, elliptica (3) vel ovata (38), vulgo 25–35 mm longa 12–18 mm lata, apice obtusa vel acuta, utrinque sparsim vel paulo dense adpresse pubescentia, margine integra; sine stipellis. Inflorescentiae axillares ramosae, plerumque floribus 13–21 ornatae, vulgo 10–15 cm longae; pedunculo 5–7 cm

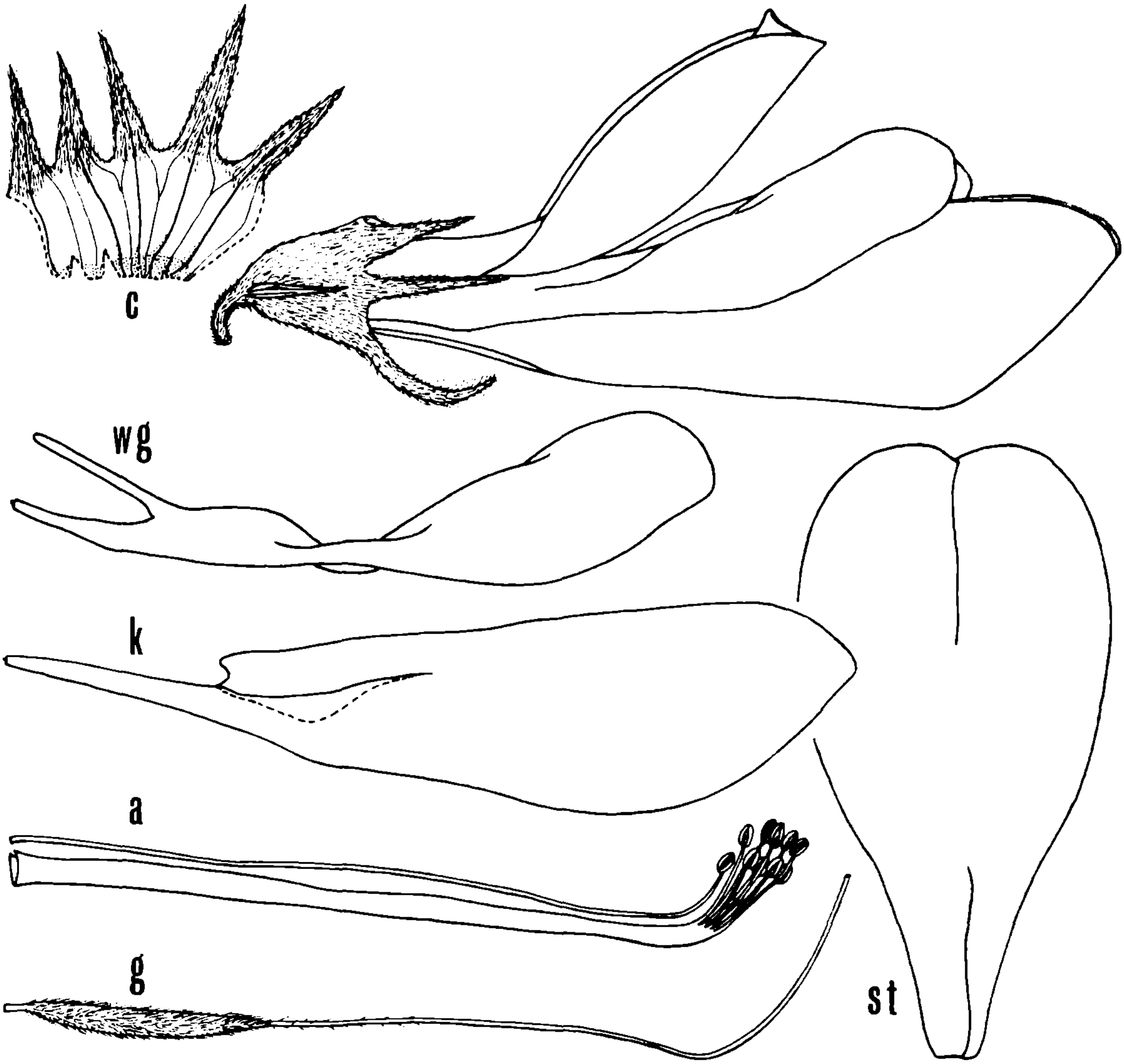

Fig. 68. Flower of *Hedysarum sikkimense* var. *megalanthum*. c. Calyx, st. Standard, wg. Wing, k. Keel-petal, a. Androecium, g. Gynoecium. All ×4. From the isotype.

longo, glabrescenti, sed rhachi, tomentosis. Bracteae membranaceae, caducae, anguste ovatae (37), apice acuminatae, vulgo 12–13 mm longae et ca. 3 mm latae, utrinque glabrae, ciliatae. Pedicelli 3–5 mm longi per anthesin, dense adscendenter pubescentes. Bracteolae subulatae (72), ca. 4 mm longae et 0.3 mm latae, sparsim ciliatae. Calyx 6–7.5 mm longus, supra medium 5-fidus; tubo laciniis longiore, ca. 4 mm longo, fere glabro; lacinia postica ceteris breviore, latissime triangulari (79), ca. 2 cm longa, laciniis lateralibus et antica anguste triangularibus (74), 3–3.5 mm longis basi ca. 1.5 mm latis. Vexillum obovatum (48), apice emarginatum, alis et carinis brevius, 18–20 mm longum et 10.5–12 mm latum, utrinque glabrum; alae unguiculatae, (ungue 3.5–3.8 mm longo incluso) 20–21 mm longae et 4–5 mm latae, apice laminarum obtusae prope basin distincte auriculatae (auricula 3.5–4 mm longa); carina petalis ceteris longior, unguiculata, (ungue 5–6 mm longo

incluso) 24.5–26 mm longa et 6–7.5 mm lata, apice laminae obtusa. Stamina diadelpha, vexillari ca. 22 mm longa, ceteris 22–24 mm longa. Pistillum 25–26 mm longum, stipitatum (stipite ca. 2 mm longo); ovario 4–5-ovulato, ca. 9 mm longo, dense et breviter adpresse piloso; stylo 14–15 mm longo, glabro. Legumen ignotum.

Typus. HAZARA. Kagan (J. F. Duthie 21252, 12 July 1897 K).

Distr. W. Himalaya: Hazara (Fig. 55).

This species is similar to *Hedysarum microcalyx*, but differs clearly in having opposite leaves and larger flowers with standard which is shorter than keel-petals and wings.

10) **Hedysarum sikkimense** Benth. ex Baker in Fl. Brit. Ind. **2**: 145 (1876)–B. Fedtsch. in Act. Hort. Petrop. **19**: 245 (1902)–Hand.-Mzt., Symb. Sin. **7**: 565 (1933)-Lauener in Not. Bot. Gard. Edinb. **30**: 246 (1970).

[Pls. 4b, 15. Figs. 67, 68, 70g, 71b]

Astragalus Mairei Lévl. in Bull. Acad. Géog. Bot. **25**: 49 (1915) & Cat. Pl. Yunnan 152 (1916).

A perennial herb, copiously branched at the top of woody rhizome. Stem slender, up to 35 cm high including the raceme, sparsely white-pubescent. Stipules leaf-opposite, scariose, connate, bifide at the apex, 0.8–1.7 cm long, sparsely pubescent outside. Leaves alternate, 2–12 cm long including the petiole, leaf-rachis almost glabrescent; petioles usually less than 1 cm long; leaflets opposite, 19–29 i.e. 9–14 pairs, elliptic (3) or sometimes ovate (38), obtuse or slightly emarginate at the apex, obtuse at the base, 3–1.4 mm long and 1.5–7 mm wide, glabrous and densely with minute dots above, appressed pubescent on the midrib or uniformly appressed white-pubescent and with minute dots below, entire along the

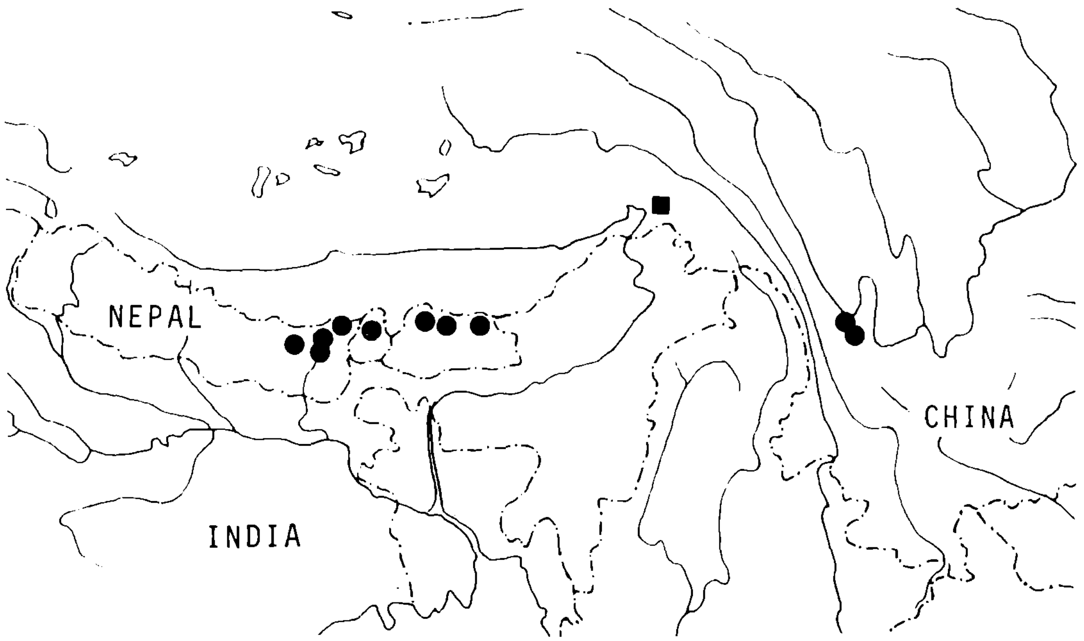

Fig. 69. Distribution of *Hedysarum sikkimense* var. *sikkimense* (●) and var. *megalanthum* (■) based on specimens examined.

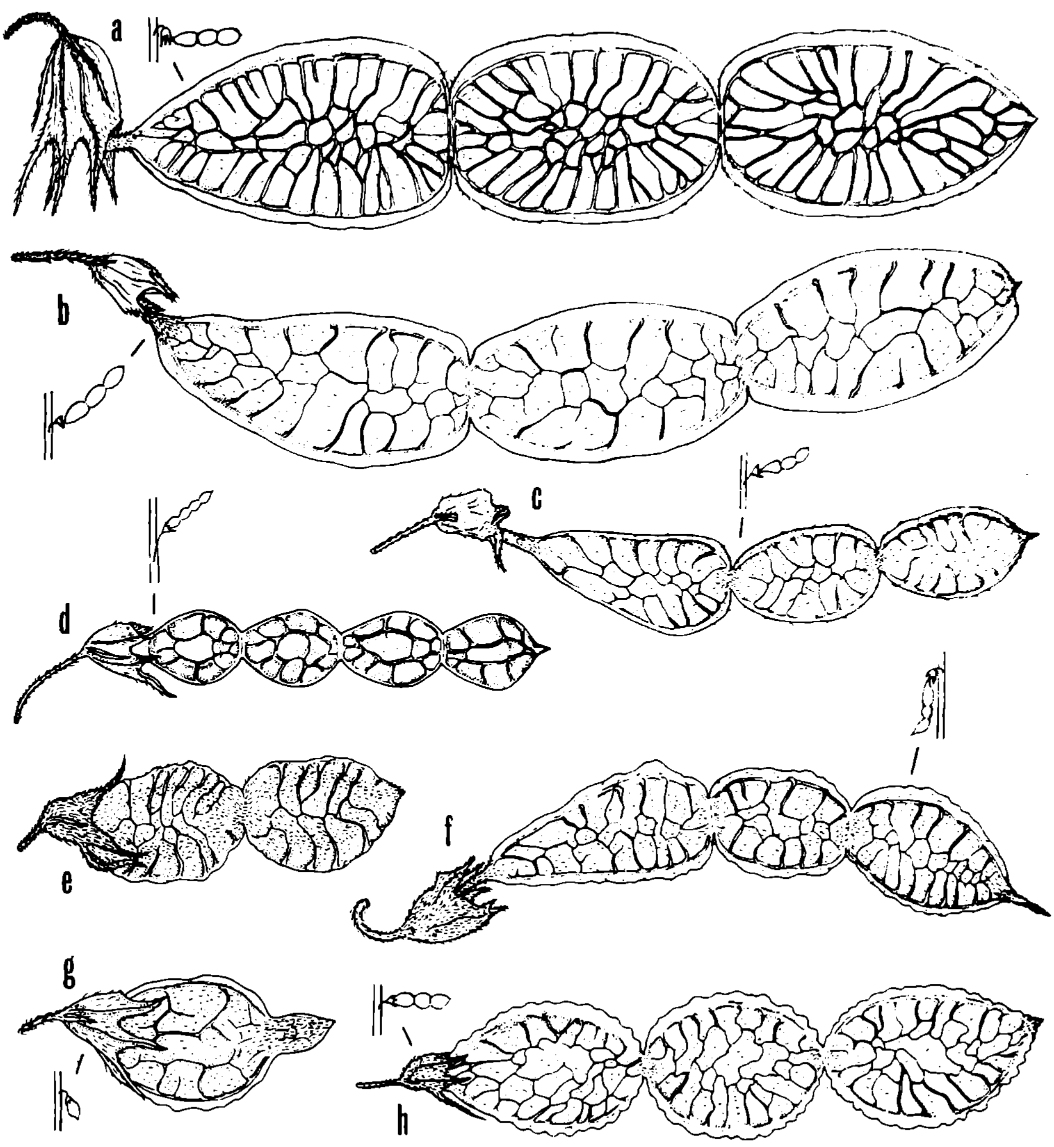

Fig. 70. Pods of the Himalayan species of *Hedysarum*. a. *H. cachemirianum* (O. Polunin 56/566), b. *H. microcalyx* (J. R. Drummond 23750), c. *H. manaslense* var. *nepalense* (Stainton, Sykes & Williams 7995), d. *H. alpinum* subsp. *laxiflorum* (lectotype), e. *H. kumaonense* (Polunin, Sykes & Williams 3480), f. *H. campylocarpon* (Dhwoj 0408), g. *H. sikkimense* (Kanai et al. 720706), h. *H. Falconeri* (lectotype). All ×2.

margin; stipels absent. Racemes axillary from the axil of upper leaf, usually each one from one axil, 4–15 cm long including the peduncle, densely pubescent along inflorescence-rachis in flower but becoming nearly glabrous in fruit, flowers dense to rather lax, 8–25-flowered per raceme, patent or pendulous in flower. Bracts narrowly ovate (37) to ovate (38), 3.5–10 mm long and 0.7–3 mm wide, pubescent or occasionally glabrescent outside, ciliate. Pedicels 2–5 mm long in flower, densely pubescent. Bracteoles narrowly ovate (36), 1.3–4 mm long and 0.3–1 mm wide, pubescent outside, ciliate. Calyx 6–7.5(–9) mm long, densely pubescent to rarely

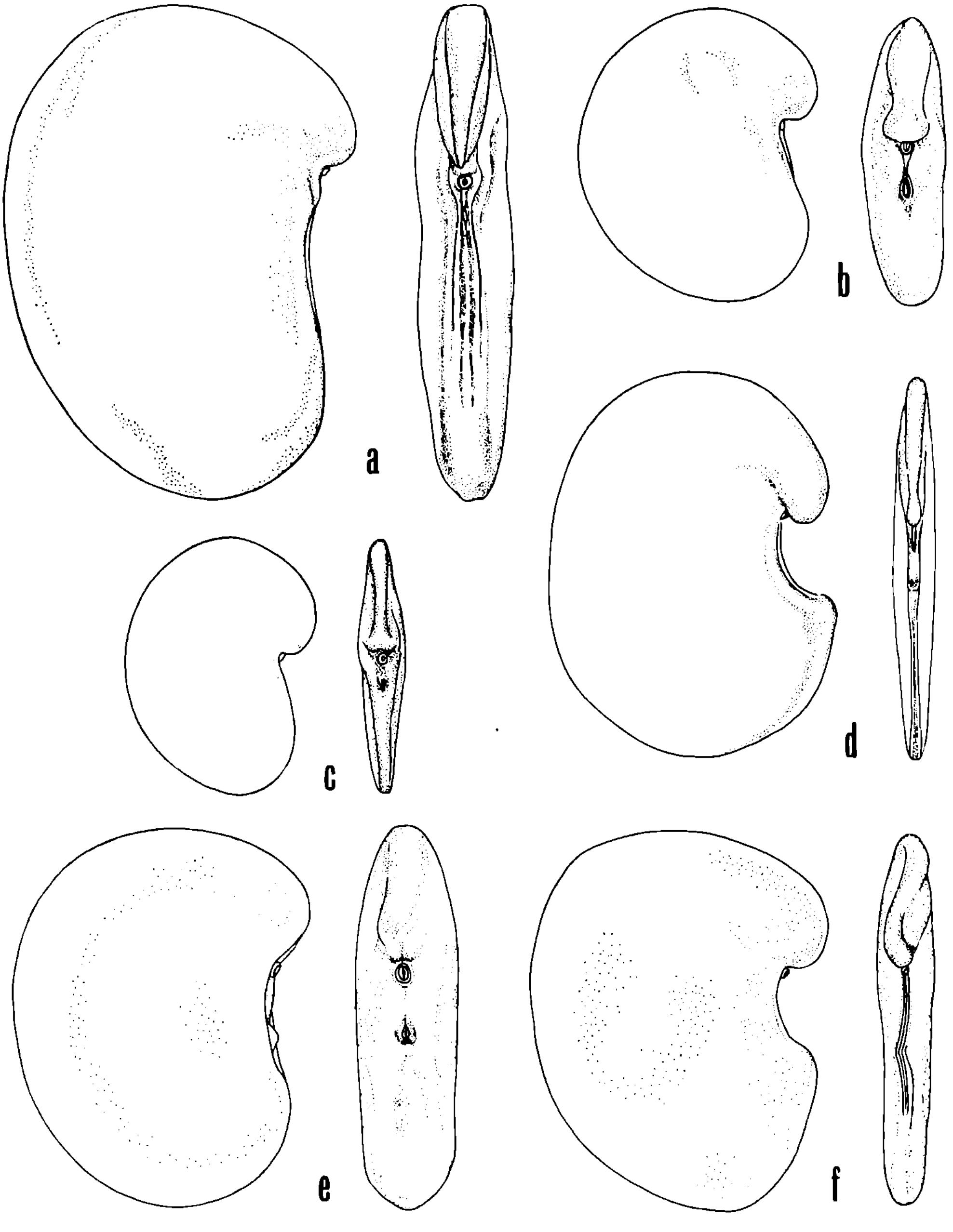

Fig. 71. Seeds of the Himalayan species of *Hedysarum*. a. *H. cachemirianum* (O. Polunin 56/566), b. *H. sikkimense* (Kanai et al. 720706), c. *H. alpinum* subsp. *laxiflorum* (lectotype), d. *H. campylocarpon* (Dhwoj 0408), e. *H. kumaonense* (Polunin, Sykes & Williams 3480), f. *H. manaslense* var. *nepalense* (Stainton, Sykes & Williams 7995). All × 10.

nearly glabrous, 5-lobed above the middle; lobes narrowly triangular (74), lower lobes 3–4.5(–6) mm long, longer than the other lobes, upper lobes 1–3(–5) mm long, shorter than the others or as long as the lateral lobes. Corolla mauve, purple, reddish purple; keel-petals longer than the other petals, standard shorter than the wings or rarely equalling or a little longer than the wings. Standard narrowly obovate (46) to obovate (47), emarginate or occasionally almost obtuse at the apex, 12.5–15.5(–21) mm long and 5.5–6.5(–10.5) mm wide, glabrous; wings 13–16.5

(–24) mm long including the claw (claws 3.5–4.5 mm long), 2–2.5(–4.5) mm wide, the lamina nearly narrow-elliptic (1), long-auriculate (auricles linear, 3–4.5 mm long), obtuse at the apex; keel-petals 14.5–18(–27) mm long including the claw (claw 4–7 mm long), 4–5(–6.5) mm wide, the lamina subacute at the apex, auriculate at the base. Androecia diadelphous, vexillar stamen 12–16(–24) mm long, usually 2–4 mm shorter than the longest one of the other stamens. Gynoecia 17–19.5(–28.5) mm long, stiped (the stipe 0.5–1 mm long) or sometimes sessile, the ovary 2(–3)-ovuled or 5-ovuled, 3–5.5 or about 7 mm long, densely appressed-pubescent, the style 12–15 mm or 18–21 mm long, glabrous or sparsely minute-pubescent near the ovary. Pods (Fig. 70g) 1–2(–3)-jointed (or probably 5-jointed in var. *megalanthum*), shortly stipitate (the stipes 1–3 mm long), with sparsely appressed minute hairs, reticulate-nerved on both surfaces, both sutures with narrow wings, wings about 0.5 mm broad and minutely erose-dentate along the margin; articles almost orbicular (6) or broadly elliptic (5), 8–10 mm long and 6–8 mm wide. Seeds (Fig. 71b) 3–3.5 × 3 × 1 mm in size.

10-i) Var. **megalanthum** Ohashi et Tateishi, var. nov.

H. tanguticum Fedtsch. in Bot. Centralbl. **84**: 274 (1900).

H. tongolense Ulbr. in Bot. Jahrb. **50**, Beibl. 110: 19 (1913).

A typo floribus 23–28 (nec 13–19) mm longis, ovariis 5 (nec 2–3)-ovulatis et in anthesis infra paginis foliorum albo-pubescentibus (nec praeter costas pubescentes glabris) differt.

S. E. TIBET. Showa La, 9500 ft., fls. purplish pink, calyx brownish green, open hill slope (Ludlow, Sherriff & Elliot 13160 BM–Holotype, TI–Isotype).

Distr. Yunnan, Szechuan, S.W. Kansu, and Tibet (Fig. 69).

10-ii) Var. **sikkimense.**

Distr. Himalaya (Kashmir to Bhutan), Yunnan, and Szechuan (Fig. 69).

Specimens examined: NEPAL. Arun–Tamur Watershed, Thagla Bhanjyang, N. of Topke Gola, 14000 ft., on riverside ground, corolla purple, calyx reddish green (J. D. A. Stainton 985 BM, TI); Arun Valley, Barun Khola, N. of Num, 12500 ft., on rocky slope, corolla mauve (Stainton 630 BM, TI); Inukhu Khola, Naulekh Muni, 27°30′N, 86°45′E, 13500 ft., among dwarf shrubs, reddish purple flowers (D. McCosh 310 BM, TI); Thudam–Lama Chungbu, 3400–4200 m (Kanai et al. 727272 TI); Lama Chungbu, 4200 m, fl. durk purple, pendulous (Kanai et al. 720706 TI); Inukhu Khola, Dudh Kosi, 14000 ft., bright purple flowers, growing among dwarf shrubs (S. B. Lyon 2079 BM); Dadh-kund, 16–18000 ft. (Lall Dhwoj 0376 BM). BHUTAN. Me La, Cho La Valley, 12500 ft., fl. purple, flat open grassland (Ludlow, Sherriff & Hicks 20435 BM, TI); Ckebisa, 13000 ft. (R. E. Cooper 1754 BM). CHINA. Yunnan, Lichiang Range (McLaren's native collectors 39a BM); Yunnan (G. Forrest 5823 BM); loc. cit. (G. Forrest 30747 TI); No precise locality (R. E. Maire 121/1914 BM).

The flowers of the Chinese specimens of the species are less expanded than those of the Nepalese ones. The specimens from Nepal and those from Bhutan differ clearly from each other in flower. Further studies based on ample materials from Sikkim and Bhutan are apparently needed.

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——. 1975. A note on *Hedysarum* and *Astragalus* (Leguminosae) with reference to two Himalayan species. Journ. Jap. Bot. **50**: 21–24.

Prain, D. 1897. Some additional Leguminosae. Journ. Asiat. Soc. Beng. **66**(2): 378.

A REVISION OF THE GENUS *HELWINGIA*

by

Hiroshi HARA and Sachiko KUROSAWA

The genus *Helwingia* is often treated as an aberrant genus of the Cornaceae, but it is unique in having epiphyllous flowers and fruits, and is considerably different from other members of Cornaceae in having 3–5-celled ovaries, and in anatomical and palynological characters. So the genus is sometimes regarded as an independent family Helwingiaceae (Decaisne 1836, Morren & Decaisne 1836, A. DC. 1868, Chao 1954, Li & Chao 1954, Takhtajan 1973), or sometimes as a member of the family Araliaceae (Bentham & Hooker f. 1867, Hutchinson 1959, 1969 & 1973, Eyde 1967).

The genus has been generally considered to include three main species, i.e. *Helwingia japonica* (Thunb.) Dietr. (1817) from Japan and China, *H. chinensis* Batalin (1893) from China, and *H. himalaica* Hook. f. et Thoms. (1879) from Himalaya. However, those species are variable, especially in China, and also several species, varieties and forms have been recently published, thus in 1951 Fang recognized 4 species and 4 varieties from China. Also the plants from Formosa and those from Ryukyu have been described as separate species, *H. formosana* Kanehira et Sasaki and *H. liukiuensis* Hatusima respectively.

Since 1960 we have been carefully observing the plants of the genus in Japan and Himalaya, and we are cultivating in Japan all races except for the Chinese ones, namely *H. japonica* var. *japonica*, var. *parvifolia*, var. *hypoleuca*, subsp. *liukiuensis*, subsp. *formosana* and *H. himalaica.*

The morphological differences between those species were briefly summarized by the senior author in 1966. But there still remain various problems which need further careful investigations especially in natural habitats.

For example, the colour of ripe fruits seems to be stable in the same race, but is often difficult to ascertain from herbarium specimens. In Japan all plants of *H. japonica* including var. *parvifolia* have consistently black fruits which turn from green to black when ripe (Pl. 5c). Subsp. *liukiuensis* of Ryukyu and subsp. *formosana* of Formosa also have black fruits. On the other hand, *H. himalaica* from Himalaya always has red ripe fruits, as illustrated in colour in Pl. 5a, b.

In China, however, both black-fruited and red-fruited races occur. The Chinese plants referred to *H. japonica* and its var. *hypoleuca* have black fruits, and also *H. omeiensis* and its var. *oblanceolata* seem to have black fruits. While typical *H. chinensis* with linear-lanceolate leaves has red fruits, although Fang (1951) described the fruits of *H. chinensis* as black. Its broad-leaved var. *crenata* also seems to have red fruits. But according to the observations by Fang (1951) in China, the fruits become red and then turn to black when mature. It may be true in some Chinese races, but such a change in colour never happens in Japan and Himalaya.

Cytologically *Helwingia japonica* from Japan has long been regarded as a high polyploid with more than 100 somatic chromosomes. The diploid number 2n=38 was first established in *H. himalaica* by the junior author in 1965. Since then she has examined cytologically several different races of the genus, and the results obtained are summarized below and in Pl. 33. It is noteworthy that the plants from Formosa and Ryukyu, and also the plant (*H. japonica* var. *hypoleuca*) raised from seeds collected in W. Hupeh (E. H. Wilson no. 132), are diploid. *H. japonica* var. *parvifolia* from south-western Japan seems to include both diploid and tetraploid races, and typical var. *japonica* from Japan is considered as hexaploid.

The pollen grains were also examined in various races. They are tricolporate (very rarely with 4 colpi) and finely spinulate (spinules less than 1μ long) on the surface. Except for *H. japonica* var. *japonica*, there are no remarkable differences in size and shape of grains among *H. japonica* var. *parvifolia*, subsp. *liukiuensis*, subsp. *formosana*, and *H. himalaica*. The pollen grains of var. *japonica* (hexaploid) are slightly larger (18–26 × 18–26μ in size) statistically than those of the other ones (14–22 ×

Chromosome numbers of the genus *Helwingia*

Species	2n	Locality	Author
Helwingia japonica	±80	Cult.	Dermen 1932
	74, 144	Japan	Wanscher 1933
var. *japonica*	120	Mt. Haguro, Prov. Shimotsuke	Nakajima 1944
	ca. 114	Karuizawa, Prov. Shinano	Kurosawa 1966
	114	Mt. Takao, Tokyo	Kurosawa 1966
	114	Jinmuji, Prov. Sagami	Kurosawa 1966
	114	Mt. Kiyosumi, Prov. Awa	Kurosawa unpubl.
var. *parvifolia*	38	Kawadzu, Prov. Idzu	Kurosawa ex Hara 1972
	38	Mt. Fujiwara, Prov. Ise	Kurosawa unpubl.
	38	Kitayama, Prov. Kii	Kurosawa unpubl.
	38	Shirakodani, Prov. Tosa	Kurosawa unpubl.
	38	Monobemura, Prov. Tosa	Kurosawa unpubl.
	38	Yabudai, Prov. Suwo	Kurosawa unpubl.
	38	Mt. Tenno, Prov. Hizen	Kurosawa unpubl.
	38	Mt. Seburi, Prov. Hizen	Kurosawa unpubl.
	38	Mitsuse-tōge, Prov. Hizen	Kurosawa unpubl.
	38	Mt. Kanmuri, Prov. Satsuma	Kurosawa unpubl.
	76	Taishakukyo, Prov. Aki	Kurosawa unpubl.
	76	Mt. Tara, Prov. Hizen	Kurosawa unpubl.
	76	Mt. Kirishima, Prov. Hiuga	Kurosawa unpubl.
var. *hypoleuca*	38	Cult., Edinb. Bot. Gard.	Kurosawa unpubl.
ssp. *liukiuensis*	38	Mt. Katsūdake, Okinawa	Kurosawa ex Hara 1972
ssp. *formosana*	38	Keito Experim. Forest, Formosa	Kurosawa 1971
	38	Mt. Nankotaisan, Formosa	Kurosawa 1971
H. himalaica	38	Ghum, Darjeeling	Kurosawa 1965

14–22μ), but the differences are not very striking.

The structure of leaves was also studied. In *H. japonica* var. *japonica*, the leaves are thinner, the cuticular layer is hardly developed on the surface, the cell-wall of epidermal cells is thin, and the lateral veins are distinctly elevated on the lower surface. The leaves of *H. himalaica* are nearly the same as those of *H. japonica*, but their cuticular layer is very slightly thicker. But in *H. chinensis*, the cuticular layer of leaves is well developed and 3.5–5μ thick, and also the cell-wall of the epidermal cells is sclerified, and the lateral veins are not prominently elevated. Still more in *H. omeiensis*, the cuticule of leaves is as much as 5–7μ thick, and the lateral veins are not elevated on the lower surface.

The undersurface of leaves was studied by scanning electron microscope. In *H. japonica* var. *hypoleuca* and var. *nanchuanensis*, the underside of leaves is covered with small papillae, and further the whole surface including that of papillae is densely and very minutely papillose under microscope (Pl. 31). In other races, the underside of leaves is almost smooth or slightly wrinkled or rugose but not papillose. However, the presence of very minute papillae on the surface seems not to be stable. In *H. omeiensis*, the undersurface is almost smooth in one specimen, but very minutely papillose in another specimen (Pl. 32). Regarding stomata, they are elliptic, and 38–48$\mu \times$ 27–43μ in size, and larger in *H. japonica* var. *japonica*. While the stomata of diploid races of *H. japonica* are slightly smaller and generally 21–38$\mu \times$ 20–27μ in size. In *H. himalaica* the length of stomata is similar to that of other diploid races, but they are much more roundish.

For this studies we have examined a large number (over 400) of specimens of the genus in many herbaria which include authentic specimens of almost all taxa hitherto published. We wish to express our sincere thanks to the authorities of the following herbaria for enabling us to study the specimens in their charge: British Museum (Natural History), London (BM), Royal Botanic Gardens, Kew (K);

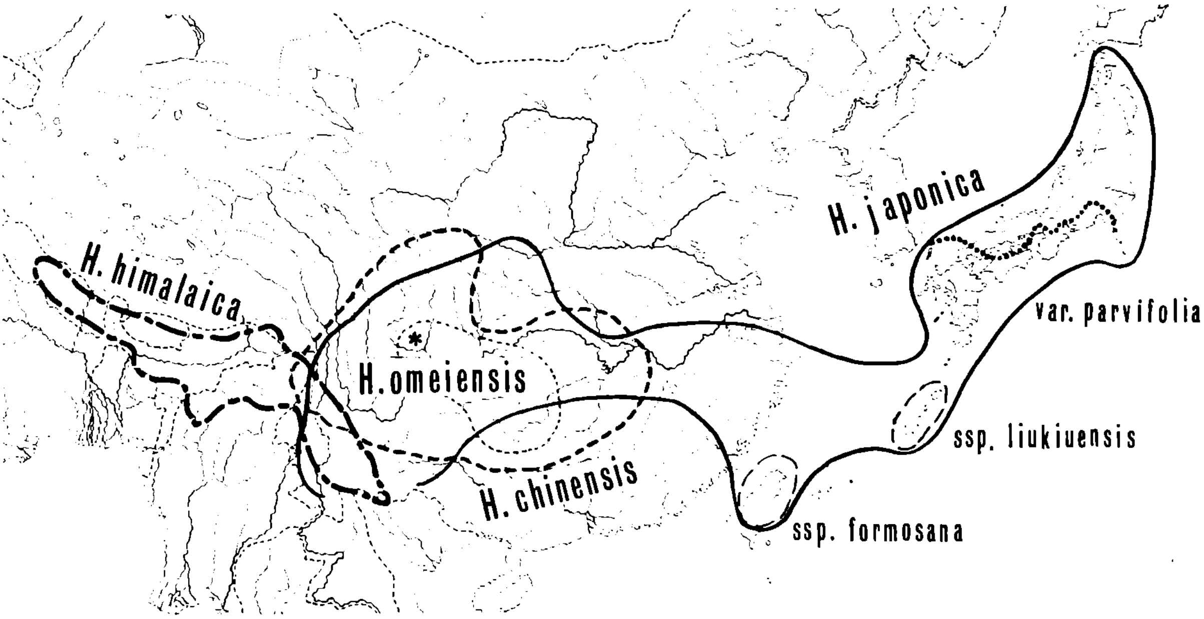

Fig. 72. Map showing an outline of distribution of the species of *Helwingia*.

Royal Botanic Garden, Edinburgh (E); Harvard Herbaria, Cambridge, U.S.A. (GH, A); New York Botanical Garden (NY); U. S. National Museum, Washington, D. C. (US); Central National Herbarium, Calcutta (CAL).

1) **Helwingia japonica** (Thunb.) F. G. Dietrich, Nachtr. Vollst. Lex. Gartn. Bot. **3**: 660 (1817)–Nakai in Bot. Mag. Tokyo **23**: 42 (1909)–Wangerin in Engl., Pfl.-reich IV-229 (Ht. 41): 35, f. 7 (1910)–Matsumura, Ind. Pl. Jap. **2**(2): 447 (1912)–Rehder in Sarg., Pl. Wilson. **2**: 570 (1916); Man. ed. 2, 681 (1940); Bibl. 495 (1949)–Hand.-Mazzetti, Symb. Sin. **7**: 685 (1933)–Fang in Act. Phytotax. Sin. **1**: 165 (1951)–Ohwi, Fl. Jap. 868 (1953); ed. Eng. 687 (1965); ed. 2, 1004 (1965)–Hara, Enum. Spermat. Jap. **3**: 337 (1954); Fl. E. Himal. 645 (1966)–Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 194, f. 115 (1971)–Icon. Cormophyt. Sin. **2**: 1110, f. 3949 (1972).

Osyris japonica Thunb., Fl. Jap. 31 (1784); Icon. Pl. Jap. **3**: t. 1 (1801).

Helwingia rusciflora Willd., Sp. Pl. **4**: 716 (1806), nom. superfl.–Sieb. et Zucc., Fl. Jap. **1**: 164, t. 86 (1835)–Decaisne in Ann. Sci. Nat. ser. 2, **6**, Bot.: 69, t. 7 (1836).

H. japonica (Thunb.) Morren et Decaisne in Bull. Acad. Sci. Brux. **3**: 170 (1836).

H. szechuanensis Fang, l.c. 167, f. 1 (1951).

subsp. **japonica** var. **japonica**. [Pls. 5c, 16, 17. Fig. 73]

Leaves obovate–*elliptic* 4–15 cm long 1.5–7 cm wide, abruptly acuminate at the apex, broadly cuneate or roundish at the base, *crenate-serrate*, *teeth* incurved *aristate-cuspidate* at the apex, herbaceous dull green above pale green beneath, lateral veins 4–6-pairs impressed above and *conspicuously elevated beneath*, petioles 1–4 cm long; stipules 4–6 mm long *laciniate* into white flexuous filiform lobes. Male flowers *green 4–6 mm* in diameter, stamens 1–2 mm long, pedicels 1–4 mm long. Fruits always *black* when ripe, 7–8.5 mm long 6–9 mm in diameter; stones oblong 6–7 mm long reticulate. *2n=ca. 114.*

Representative specimens:

Hokkaido. Tanihujigawa, Prov. Iburi (I. Yamamoto, Jul. 27, 1939, KYO); Hakodate-Yama (S. Nozawa, Sep. 1887, fr., SAP).

Honshu. Prov. Mutsu: Shiriya–Kuwabata-yama, Shimokita (H. Ohashi, Jul. 31, 1964, TI); Natsudomari Penin. (K. Hosoi, Jun. 7, 1953, TI). Prov. Ugo: Nibetsu (H. Muramatsu, Jun. 30, 1929, TI); Mayama, Oga Penin. (R. Fujii, May 21, 1959, fl., TI); Kabuto-iwa, Yamadera (H. Ohashi, Y. Tateishi & H. Ohba, Aug. 3–4, 1970, TI). Prov. Rikuzen: Sendai (Y. Ogura, Jun. 26, 1916, fr., TI). Prov. Iwaki: Hagurosan, Sôma-shi (S. Kurosawa, May 18, 1958, TI). Prov. Iwashiro: Mt. Bandai (H. Hara, Aug. 2, 1957, TI). Prov. Hitachi: Mt. Tsukuba (M. Honda, May 2, 1926, TI). Prov. Shimotsuke: Urami, Nikko (H. Ito, 1931, TI). Prov. Kodzuke: Mt. Myogi (H. Kanai, May 19, 1962, fl., TI). Prov. Awa: Mt. Kiyosumi (H. Kanai, Jul. 29, 1948, TI). Prov. Musashi: Kariyose-yama (T. Nakai, May 8, 1930, TI); Shimura (M. Honda, Apr. 27, 1924, TI); Mt. Takaosan (K. Hisauchi, Jun. 30, 1918, TI). Prov. Sagami: Yokohama (Maximowicz, 1862, fr., K); Jinmuji (Y. Momiyama, May 7, 1933, fl., TI); Mt. Ōyama (K. Hisauchi, May 21, 1914, fl., TI). Prov. Idzu: Motomura, Oshima Is. (M. Mizushima, Sep. 20, 1950,

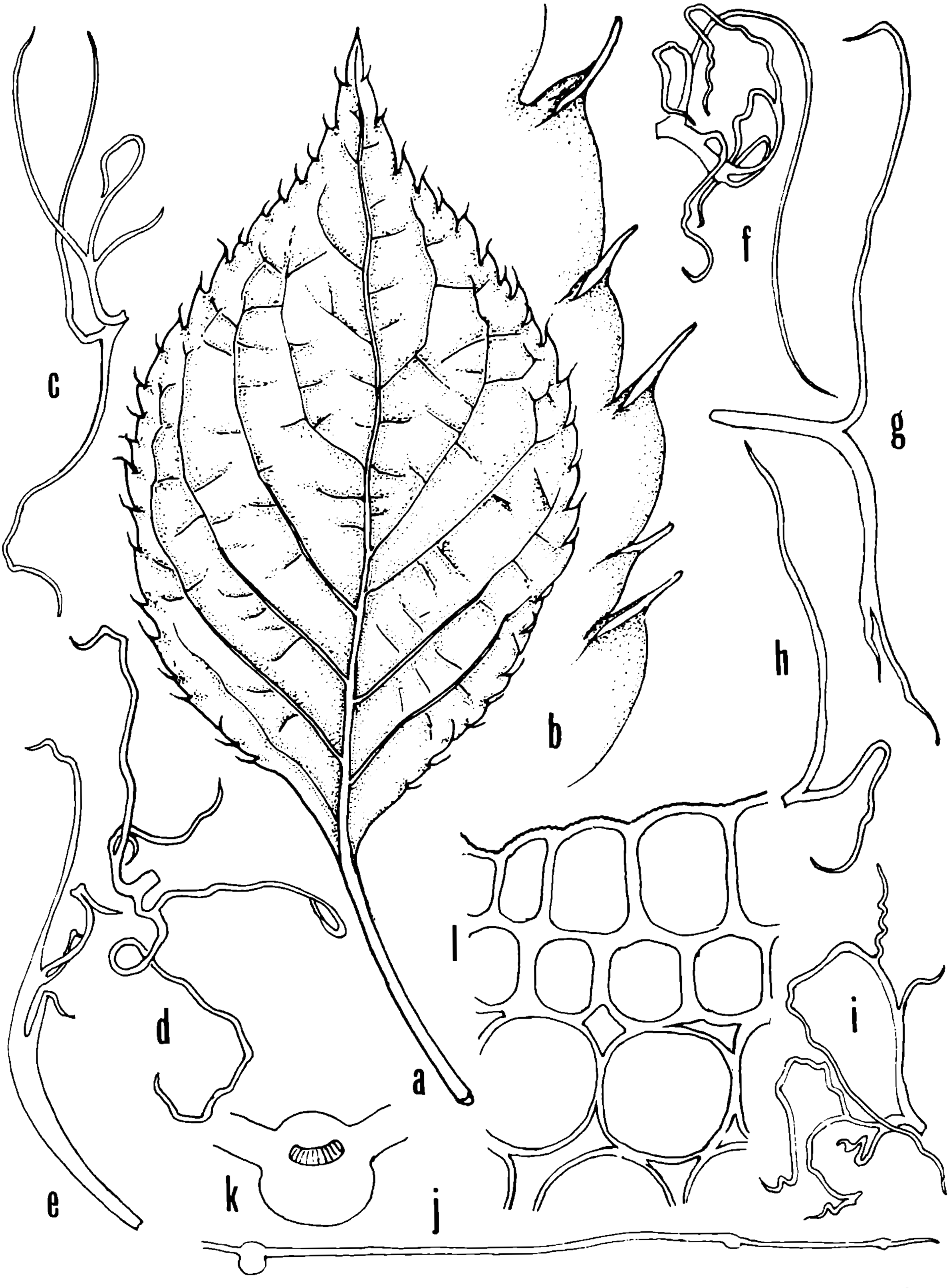

Fig. 73. *Helwingia japonica* (Th.) Dietr. var. *japonica*. a. Leaf, × 1. b. Leaf-margin, × 5. c–i. Stipules, × 10. j. Cross section of leaf. × 3, k. Cross section of midrib of leaf. l. A part of the upperside of k, mag.

TI). Prov. Shinano: Usui Pass (H. Hara & S. Kurosawa, Aug. 10, 1971, TI); Mt. Hachibuse (S. Momose, Jul. 29, 1933, fr., TI). Prov. Kai: Mt. Mishōtai (H. Kanai, Jun. 4, 1956, TI); Oshino, Mt. Fuji (M. Togashi, May 23, 1964, TI). Prov. Suruga: Mt. Kunosan (M. Mizushima, Dec. 13, 1951, TI); Tokusa, Ikawa-mura (M. Matsuda, Jul. 8, 1954, TI). Prov. Mikawa: Higashisonome, Tōei-machi (K. Torii, Jul. 10, 1949, TI). Prov. Kaga: Chūgū-onsen (N. Satomi, Jun. 5, 1951, TI). Prov. Etchu: Futakamiyama, Takaoka-shi (N. Satomi, May 12, 1963, TI). Prov. Omi: Mt. Ibuki (Kitamura & Murata, Jul. 7, 1963, KYO); Mt. Hiei (H. Yamamoto, Jun. 4, 1933, TI). Prov. Tanba: Asiu (T. Nakai, Jul. 16, 1940, TI). Prov. Tango: Mt. Misen (G. Koidzumi, May 27, 1928, KYO). Prov. Kawachi: Mt. Kongōsan (T. Nakai, Nov. 1921, TI). Prov. Kii: Akitsukawa-mura (T. Nakajima, Jun. 22, 1930, TI). Prov. Hōki: Mt. Daisen (Y. Okamoto, KYO). Prov. Oki: Oki-no-shima (G. Koidzumi, Jul. 1924, KYO). Prov. Iwami: Azōjisan, Nanukaichimura (H. Kanai, Oct. 29, 1958, TI). Prov. Aki: Garyusan, Geihoku-machi (H. Kanai, Oct. 15, 1955, TI).

Shikoku. Prov. Tosa: Mt. Ishidate, 800 m (H. Ohashi, Jun. 20, 1966, TI).

Kyushu. Prov. Buzen: Iwatake (Matsumura?, Aug. 3, 1882, TI). Prov. Hizen: Miadzi, Nagasaki (Maximowicz, 1863, fl., K, BM). Prov. Higo: Kishimadake, Mt. Aso, 1000 m (H. Kanai, Oct. 29, 1958, TI); Mt. Nokeeboshi (T. Shimizu, Aug. 29, 1959, KYO). Prov. Hiuga: Mi-ike, Higashi-Kirishima, 400 m (M. Togashi, Apr. 27, 1970, TI). Prov. Osumi: Mt. Takakuma (H. Ohba & J. Murata, Jul. 3, 1974, TI). Prov. Satsuma: Kamuridake, Kushikino-shi, 500 m (M. Togashi, Apr. 25, 1970, TI).

China. Chekiang: Tihtaishan (R. C. Ching no. 1418, E); Tien Mou Shan (R. C. Ching no. 4998, K, E).

Anhwei: Tien Chu Shan (Fan & Li no. 233, BM); Chiu Hwa Shan (Fan & Li no. 94, K, E); ibid. (R. C. Ching no. 2800, K, E); Wang Shan (A. N. Steward no. 7135, fr., A, K).

Kiangsi: Lu Shan (N. K. Ip no. 1093, K).

Hupeh: Patung (Henry nos. 2849 & 3775, K); W. Hupeh (Henry no. 5282E, BM, K); W. Hupeh (E. H. Wilson, no. 632 K, E).

Kweichow: Fan Ching Shan (Steward, Chiao & Cheo no. 503, BM).

Yunnan: E. flank of Tali Range (Forrest no. 4608, K, E); E. flank of Lichiang Range (Forrest no. 5758, E, K); Lichiang Range (Forrest no. 10060, E, K, BM); Mekong-Salwin Divide (Forrest no. 14600, fr. black, E); Chienchuan-Mekong divide (Forrest no. 21942, fr. black, A, E, K); Ho-ki-keon (Maire no. 481, fr. black, E); Atuntze (T. T. Yü no. 10183, fr. black, E, BM); Lichiang Snow Range (T. T. Yü no. 15042, BM, E); without precise locality (K-Ward no. 641, E); (Y. Tsiang no. 13202, K).

Szechuan: Nanchuan (Fang nos. 965, 1008 & 1118, E); Kuan Hsien (Fang no. 2197, fr. black, E); Mt. Omei (Fang nos. 3094, E; 6565, K; 7661, K; 7758, K; 12665, BM); Mt. Omei (S. S. Chien no. 5530, E); Mt. Omei (H. C. Chow no. 7574, A); Pao-hsing-hsien (K. L. Chu nos. 3161, 3203 & 3534, BM, E); Szechuan sept. (Potanin, Aug. 13, 1885, K). Szechuan–Tibet, Tachienlu (Pratt no. 62, K, BM).

Distr. S. Hokkaido, Honshu (alt. 100–1400 m), Shikoku, Kyushu, and C. & W.

China.

Typical var. *japonica* from Japan seems to be hexaploid, and has usually large herbaceous broad leaves, divided flexuous stipules, larger green flowers, shorter pedicels of male flowers, and invariably black fruits. Narrow-leaved individuals (f. *lancifolia* Hayashi in Bull. Forest Exper. Stat. **107**: 28, t. 3, f. 29, 1958) are rarely found in Central Honshu.

The plants from Kyushu sometimes show intermediate morphological characters between var. *japonica* and var. *parvifolia*, and also a tetraploid race was found in Kyushu. More detailed studies are needed on the plants from Kyushu (see a note under var. *parvifolia*). The occurrance of this species in Is. Yakushima is uncertain.

Handel-Mazzetti (1933) and Fang (1951) included various specimens with broad leaves from China in *H. japoncia.* But the specimens from N. Burma and Bhutan cited by them under *H. japonica* are, in our opinion, identical with *H. himalaica.* Some Chinese specimens (Pl. 17) agree well with typical *H. japonica* of Japan in leaves, stipules, flowers and fruits, and they cannot be distinguished from the Japanese specimens also in pollen and stomata. Judging from the original description and figure, *H. szechuanensis* Fang seems to be an extreme form of *H. japonica* with fruits in the upper part of leaves.

However, these Chinese plants have hitherto never been cytologically studied, and it is urgent to know whether the Chinese plants referred to *H. japonica* are hexaploid as var. *japonica* or not.

1a) *H. japonica* var. **parvifolia** Makino in Bot. Mag. Tokyo **27**: 80 (1913)–Hara, Enum. Spermat. Jap. **3**: 337 (1954)–Yamanaka in Journ. Jap. Bot. **41**: 375 (1966)–Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 195 (1971).

[Pl. 19a. Fig. 74a–i]

H. japonica f. *parvifolia* (Makino) Sugimoto et f. *microphylla* Sugimoto, New Key Jap. Tr. 462 (1961).

Leaves *smaller* (2–)3–6(–8) cm long (1–)1.5–3(–4) cm wide, dark green and often *somewhat glossy* above, light green beneath, lateral veins *2–3*(–4)*-pairs*; stipules divided as in the type, but often smaller 1.5–4 mm long. Anthers smaller. Fruits black. *2n=38* (or 76).

Representative specimens:

Japan. Honshu. Prov. Kai: Shimobe (K. Hisauchi, Jul. 21, 1939, fr., TI); Kai-koma, 900 m (H. Uematsu, Jul. 28, 1949, fr., TI). Prov. Idzu: Nekko, Mt. Amagi (T. Nakai, Jun. 1932, fr., TI); Kawadzu (H. Hara & S. Kurosawa, Apr. 25, 1972, TI); Simoda (C. Wright 1853–56, GH, NY, K). Prov. Suruga: Subashiri–Ipponmatsu (Y. Satake, May 26, 1935, fl., TI); Mt. Ryusô (M. Honda, Jun. 16, 1935, fr., TI); Sakashita, Setonoya-mura (D. Shimidzu, Oct. 20, 1929, TI). Prov. Totomi: Misakubo–Yamadzumi (H. Hara, May 5, 1957, bud, TI). Prov. Kii: Doba, Kitayama-mura (H. Hara & S. Kurosawa, Jun. 1, 1961, TI); Ikuma-mura, Nishi-muro-gun (T. Nakajima, Jun. 8, 1930, fr., TI). Prov. Yamashiro: Kibune (T. Nakai, Jul. 19, 1940, fr., TI). Prov. Settsu: Maya-san (S. Okamoto, Jun. 6, 1936, TI). Prov. Bizen: Tanagase, Niimi (T. Shimidzu, Sep. 13, 1958, KYO). Prov. Aki: Gokurakujiyama (Z. Tashiro, May 27, 1928, KYO). Prov. Suwo: Namerayama Forest (K. Oka, Aug. 6, 1948, KYO). Prov. Nagato: Naganobori, Mine-gun (T.

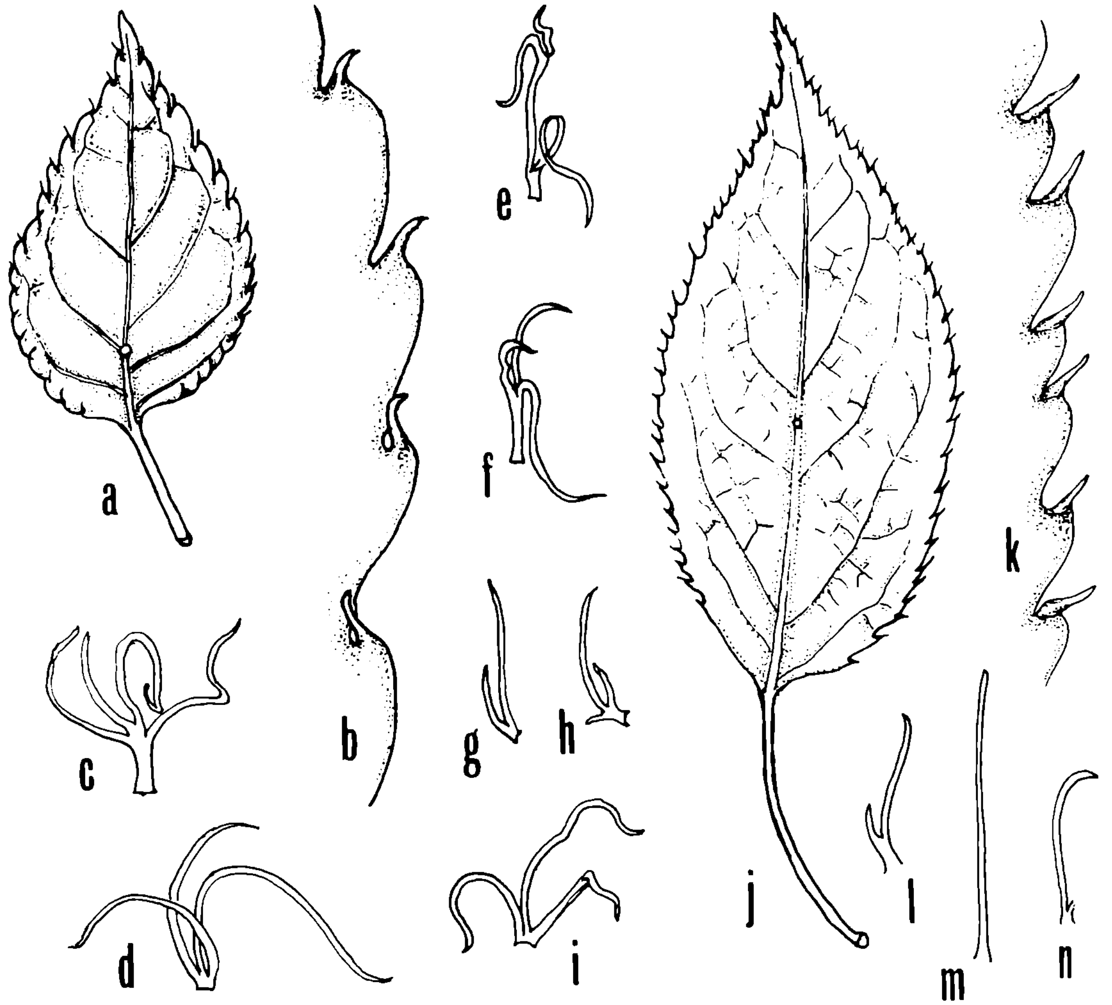

Fig. 74. *Helwingia japonica* var. *parvifolia* Makino (a–i) and var. *hypoleuca* Hemsl. ex Rehder (j–m). a & j. Leaf, ×1. b & k. Leaf-margin, ×5. c–i & l–n. Stipules, ×10.

Nakai, Oct. 1920, TI).

Shikoku. Prov. Awa: Shimomyō, Nishi-iyayama (Yatabe?, Jul. 25, 1888, TI). Prov. Tosa: Mt. Ishidate (H. Ohashi, Jun. 20, 1966, fr., TI); Nanokawa-mura (K. Watanabe, Apr. 25, 1889, fl., TI). Prov. Iyo: Mt. Onigajô (T. Nakai, TI).

Kyushu. Prov. Tsushima: Hidakatsu, Kamitsushima (T. Nakai, Jul. 28, 1921, TI). Prov. Buzen: Ehikosan (Faurie no. 55, May 3, 1907, A, KYO). Prov. Hizen: Mt. Tara (K. Ohki, Aug. 6, 1934, TI); Mt. Kinugasa, Unzen (H. Hara, Oct. 17, 1941, TI). Prov. Hiuga: Shiiba-mura (H. Kanai, Oct. 21, 1958, TI); Udo-jingū (T. Yamazaki, May 2, 1954, TI). Prov. Osumi: Tashiro-mura (Z. Tashiro, Jul. 28, 1928, KYO).

Distr. South-western Honshu, Shikoku, and Kyushu (in forests at lower altitudes below 900 m high).

Typical var. *parvifolia* (Pl. 19a) has smaller often roundish dark green and somewhat glossy leaves with 2–3 pairs of lateral veins, and was proved to be diploid by the junior author for the first time. It is distributed in the south-western parts of

Japan, and in Shikoku and Kyushu var. *parvifolia* is more common than var. *japonica*. The variety often occurs at the lower altitudes than var. *japonica*.

But intermediate forms with larger often elongate leaves with 4–5-pairs of lateral nerves are found here and there. It is remarkable that some of them from Prov. Hizen, Prov. Hiuga, and also from Prov. Aki have ca. 76 somatic chromosomes (Pl. 33g), and are possibly tetraploid (see a note under *H. japonica* var. *japonica*). It is uncertain whether this tetraploid race was derived from diploid var. *parvifolia*, or it is of a hybrid origin between diploid var. *parvifolia* and hexaploid var. *japonica*.

1b) *H. japonica* var. **hypoleuca** Hemsley ex Rehder in Sarg., Pl. Wilson. **2**: 570 (1916)–Hand.-Mzt., Symb. Sin. **7**: 686 (1933)–Fang in Act. Phytotax. Sin. **1**: 166 (1951). [Pl. 18c, d. Fig. 74j–m]

H. rusciflora Willd. sensu Hemsley in Journ. Linn. Soc. **23**: 441 (1888), p.p.

Leaves ovate–oblong 4–9 cm long 1.8–4 cm wide long-acuminate at the apex, crenate-serrate with incurved long-cuspidate teeth, thick-herbaceous dull green above, more or less *glaucous* and *densely covered with small papillae* under lens on the lower surface, lateral veins 4–5-pairs, stipules to 2 mm long *1–3-divided. 2n=38.*

Specimens examined:

China. Yunnan: Lichiang Range (McLaren no. C45, K).

Szechuan: Mt. Omei (Fang no. 2793, E); ibid. (L. Y. Tai no. T142, fr. black, A); E. Szechuan (Farges no. 758, A).

Shensi: Tai-pei-shan (Purdom no. 901, K); (Giraldi, Jul. 16, 1897, K).

Hupeh: Patung (Henry no. 1706–type of var. *hypoleuca*, A, K); W. Hupeh (E. H. Wilson no. 132, E; no. 132a, A).

Fortunately we could cytologically examine a plant of this variety cultivated in the Royal Botanic Garden at Edinburgh. The plant was raised from the seeds of Wilson No. 132 from Hupeh, and was proved to be diploid with 38 somatic chromosomes.

In this variety the underside of leaves is densely and minutely papillose, and moreover the whole surface even of papillae is densely covered with very minute papillae under microscope (Pl. 31a, b). But some Chinese specimens seem to be intermediate between var. *hypoleuca* and var. *japonica*.

1c) *H. japonica* var. **nanchuanensis** Fang in Act. Phytotax. Sin. **1**: 167 (1951). [Pl. 18a, b]

Shrub ca. 6 m high. Leaves *oblong-lanceolate* 4.5–5 cm long 12–15 mm wide *acutish* at the apex obtuse or cuneate at the base, *minutely serrate* with many small teeth, somewhat thick, lateral veins 4–5-pairs *conspicuously impressed above elevated beneath*, petioles 2–3 cm long slender, stipules *subulate* sometimes bifid.

Specimen examined:

China. Szechuan: Jin-fo-shan, Nanchuan Hsien (C. Y. Hwang no. 91, Aug. 1926, fr. green–isotype, A).

In is noteworthy that the underside of leaves is minutely papillose as in var. *hypoleuca* (Pl. 31c, d). In some morphological characters the specimen resembles *H. himalaica* var. *parvifolia* and also *H. omeiensis* var. *oblanceolata*. But the material of this variety is too scanty to fix its real affinity.

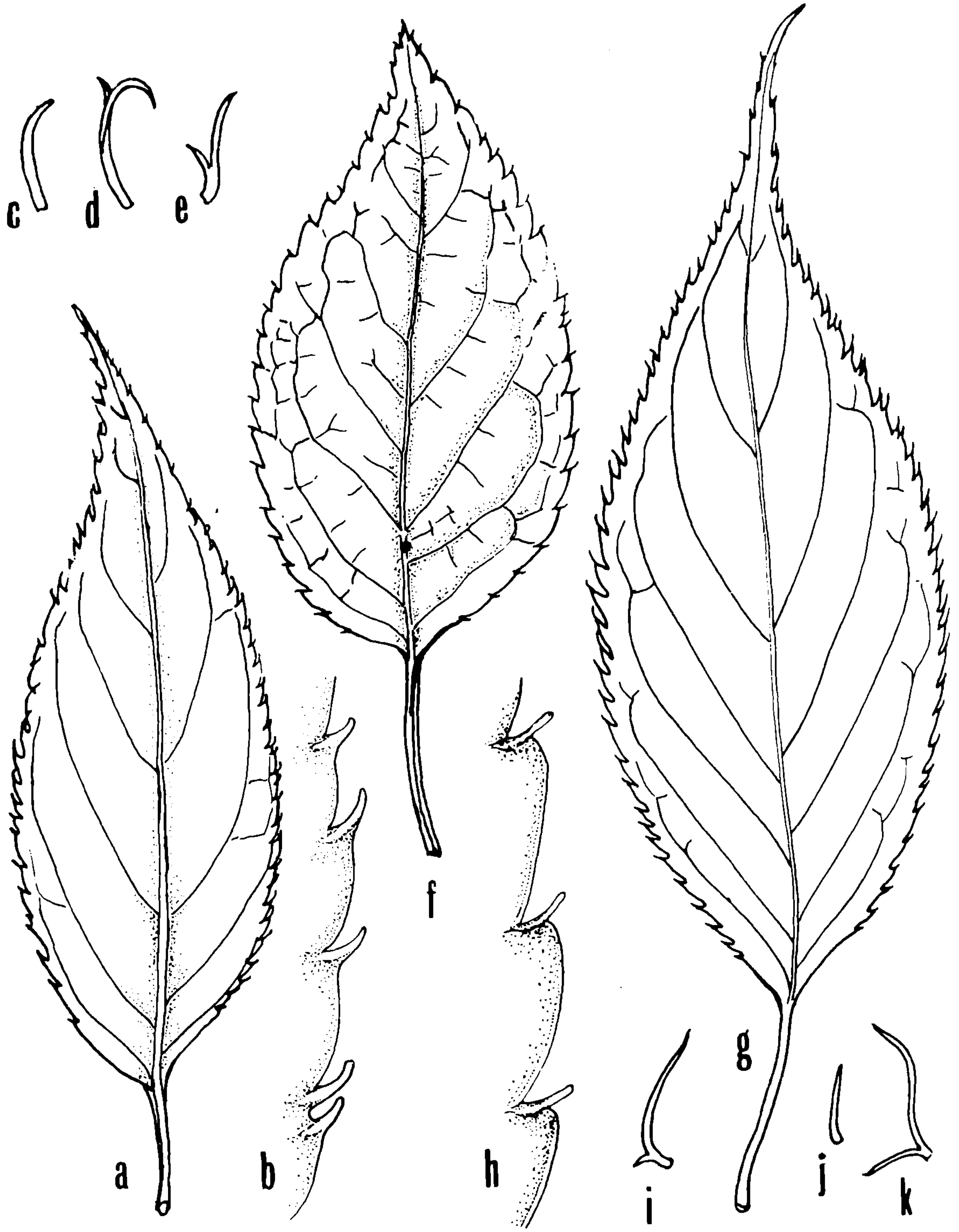

Fig. 75. *Helwingia japonica* subsp. *liukiuensis* (Hatus.) Hara et Kurosawa (a–e) and subsp. *formosana* (Kaneh. et Sasaki) Hara et Kurosawa (f–k). a, f & g. Leaf, × 1. b & h. Leaf-margin, × 5. c–e & i–k. Stipules, × 10.

1d) *H. japonica* subsp. **liukiuensis** (Hatusima) Hara et Kurosawa, stat. nov. [Pl. 19b. Fig. 75a–e]

H. rusciflora Willd. sensu Ito et Matsumura, Tent. Fl. Lutch. 536 (1899).

H. liukiuensis Hatusima in Journ. Jap. Bot. **12**: 874 (1936)–Hara, Enum. Spermat. Jap. **3**: 337 (1954)–Masamune in Sci. Rep. Kanazawa Univ. **3**: 295 (1955)–Hatusima, Fl. Ryukyus 457 (1971).

H. japonica var. *liukiuensis* (Hatusima) Murata [in Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 195 in textu (1971), comb. nud.] in Act. Phytotax. Geobot. **25**: 39 (1972).

Leaves oblong-lanceolate–ovate 5–18 cm long 2–8 cm wide, caudate-acuminate at the apex, broadly cuneate at the base, *aristate-serrate*, herbaceous somewhat thickish and *glossy*, lateral veins 4–6-pairs obscurely impressed above *slightly elevated beneath*; petioles 0.8–6 cm long; stipules 1–3 mm long *filiform* mostly undivided sometimes 1–2-serrulate. Male flowers green ca. 4 mm in diameter, pedicels 1.5–5 mm long. Fruits *black* when mature 5–6 mm in diameter, stones ca. 5 mm long, reticulate-pitted. *2n=38.*

Representative specimens:

Amami-Oshima: Okumata, Naze City (Hatusima & Sako nos. 21848 & 21849, TI); Yuwan, 50 m (Sako no. 6007, fl., TI); Yuwan-dake (Enomoto, Apr. 26, 1969 fl., TI); Nishinahama, 100 m (Fukuoka no. 7900, fl., TI); Shidokan, 200 m (Sako no. 5959, fr., TI).

Okinawa (T. Miyagi, young fr., TI); Onnadake, 200 m (Hatusima no. 17839, TI); Katsūdake, 300–400 m (Yamazaki no. 311, fr., TI); Hentona–Yonahadake (Y. Kimura & Hurusawa, Sep. 17, 1940, TI); Mt. Nago, 300 m (Kurata & Nakaike no. 1406, KYO, K).

Distr. S. Kyushu (Amami-Oshima, Tokunoshima) and Ryukyu (Okinawa, Ihiya).

The Ryukyu plants are closely related to *H. japonica*, but are distinguishable from the latter in having lustrous leaves with less conspicuous veins when fresh, generally undivided shorter stipules, and 38 somatic chromosomes.

1e) *H. japonica* subsp. **formosana** (Kanehira et Sasaki) Hara et Kurosawa, stat. nov. [Pl. 19c. Fig. 75f–k]

H. rusciflora Willd. sensu Hayata, Gen. Ind. Fl. Formos. 33 (1917).

H. formosana Kanehira et Sasaki in Kanehira, Formos. Tr. ed. rev. 532, f. 491 (1936).

H. japonica Dietr. sensu Liu, Ill. Lign. Pls. Taiwan **2**: 955, f. 788 (1962).

H. chinensis Batal. sensu H. L. Li, Woody Fl. Taiwan 679, f. 284 (1963).

H. japonica var. *formosana* (Kanehira et Sasaki) Kitamura [in Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 195 in textu (1971), comb. nud.] in Act. Phytotax. Geobot. **25**: 39 (1972).

Leaves oblong-lanceolate–elliptic 5–12 cm long 1.5–6 cm wide, *caudately acuminate* at the apex, broad-cuneate at the base, *closely aristate* crenate-*serrate*, herbaceous, lateral veins 5–6-pairs, veins impressed above *conspicuously elevated beneath*; petioles 0.5–5 cm long; stipules 0.5–2 mm long *filiform* undivided or 2–3-divided. Male flowers light green 3.5–5 mm in diameter; pedicels 1.5–3 mm long, often on bract-like leaves. Fruits globose *black* when mature, 5–7 mm across. *2n=38.*

Representative specimens:

Formosa. Mt. Taipei-zan (Hayata & Sasaki, May 7, 1917, fl. ♂-isosyntype, TI); Keitao (Hayata, Apr. 12, 1916, fl. ♀, TI); Nantou Hsien (M. T. Kao no. 7176, fr., TI); Nanhutashan, 1700 m (Yamazaki et al. no. 542, TI); Tawushan (Namba et al. no. 382, fr., TI); Arisan, 2500 m (Faurie no. 437, KYO).

Distr. Formosa (in high montane forests, rare).

This subspecies is most closely related to *H. japonica*, but differs from the latter by somewhat elongate leaves with a caudate apex, shorter less divided stipules, and is diploid. In the shape of leaves it also resembles *H. himalaica*, but has leaves with aristate teeth and fewer conspicuous lateral veins, larger green flowers, and black fruits. *H. japonica* including subsp. *liukiuensis* and subsp. *formosana* are totally deciduous, but in *H. himalaica* the leaves persist throughout winter in warmer places or in green house. It is presumed that a diploid ancestral race had once been distributed continuously from China to Japan, then it was separated geographically in China, Formosa, Ryukyu, and Japan, and the populations in Formosa and Ryukyu have differentiated into different races.

2) **Helwingia himalaica** Hook. f. et Thoms. ex C. B. Clarke in Fl. Brit. Ind. **2**: 726 (1879)–Wangerin in Engl., Pfl.-reich IV-229 (Ht. 41): 37 (1910)–Rehder in Sarg., Pl. Wilson. **2**: 571 (1916), p.p.–Hand.-Mzt., Symb. Sin. **7**: 686 (1933), p.p.–Das, Fl. Assam **2**: 372 (1938)–Li in Taiwania **1**: 95 (1948), p.p.–Fang in Act. Phytotax. Sin. **1**: 168 (1951), p.p.–Hara, Fl. E. Himal. 232, 645 & 662, pl. 4a (1966); **2**: 92 (1971)–Icon. Cormophyt. Sin. **2**: 1111, f. 3951 (1972)–Stainton, Forests of Nepal f. 73 (1972). [Pls. 5a, b, 20. Fig. 76]

H. japonica var. *himalaica* (Hook. f. et Thoms.) Franchet, Pl. David. **2**: 67 (1885), quoad basionym tantum.

H. lanceolata Watt ex Das, l.c. 373 (1938), nom. subnud.

H. himalaica var. *lanceolata* Deb in Bull. Bot. Surv. Ind. **3**: 273 (1962).

Leaves *elongate* broad lanceolate–oblong sometimes elliptic 5–11(–18) cm long 1–4(–6.5) cm wide, *long-caudately acuminate* at the apex, broad cuneate or obtuse at the base, closely crenate-serrate with depressed *shortly cuspidate teeth*, rarely persistent, thick herbaceous, lateral veins *conspicuous* 5–9-pairs slightly impressed above *elevated beneath*; petioles 0.8–3.5 cm long; stipules *filiform* to 2 mm long undivided or divided into 2–3 filiform lobes. Male flowers green *often dark purplish* ca. *3–3.5 mm* in diameter, often even on bract-like leaves; pedicels 0.5–3 mm long. Fruits consistently *red* when mature, 6–9 mm long, 6–8 mm in diameter, stones 5–6 mm long. *2n=38.*

Representative specimens:

E. Himalaya (Griffith no. 4687, fr., K).

Nepal: Siklis, N. of Pokhara, 7000 ft. (Stainton, Sykes & Williams no. 4919, BM, E); Arun Valley (Stainton no. 5930, BM); Minchin Dhap–Mul Pokhari (Hara et al. no. 6300518, fr. red, TI); Tamur Valley, 8000 ft. (Stainton no. 1301, fr., BM).

Darjeeling: 8000 ft. (C. B. Clarke no. 27361A, fr., K); Senchal, 8000 ft. (Gamble no. 3043B & C, K; no. 8068, K); Ghum, 2300 m (Hara, Kurosawa & Ohashi nos. 69779 & 69780, fr. red, TI); Palmajua–Batasi, 2200–2100 m (Kanai et al., Aug. 8,

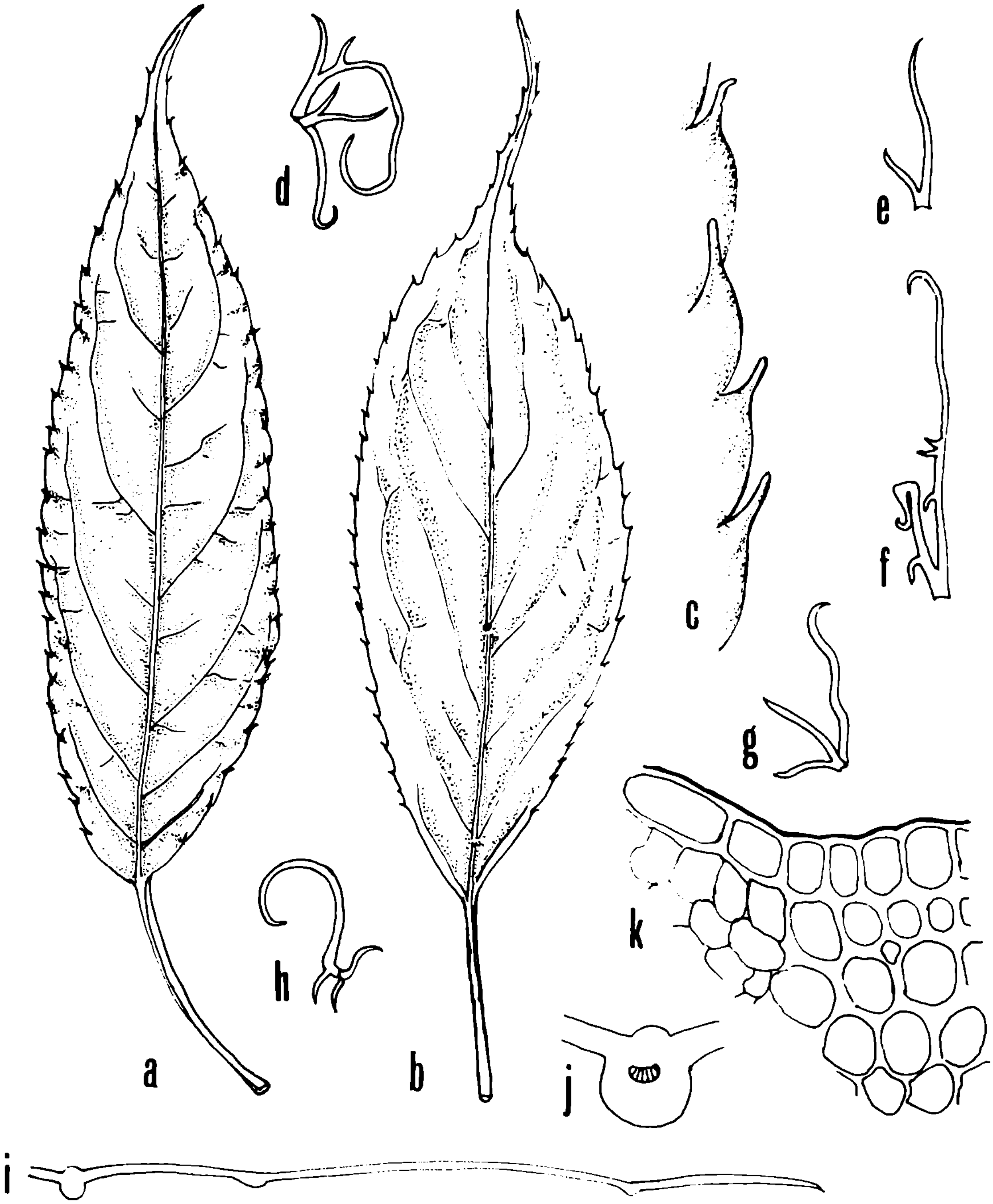

Fig. 76. *Helwingia himalaica* Hook. f. et Thoms. a, b. Leaf, ×1. c. Leaf-margin, ×5. d–h. Stipules, ×10. i. Cross section of leaf, ×3. j. Cross section of midrib of leaf. k. A part of the upperside of j, mag.

1972, fr. red, TI); Gairibas–Tonglu (Hara et al. no. 6135, TI).

Sikkim: 8–9000 ft. (Hooker f.–type of *H. himalaica*, K).

Bhutan: Duke La, Timpu, 10000 ft. (Cooper no. 2684, E, BM); Gasa–Pari La (Kanai et al. no. 12692, TI); Tamji–Gasa (Kanai et al. no. 13012, TI).

Assam: Delei Valley, 5–6000 ft. (K.-Ward no. 8104, fl., K); Khasia, 5–7000 ft. (Hook. f. et Thoms., K); Shillong (C. B. Clarke nos. 43411A & 44075J, BM);

Konoma (Watt no. 11532, CAL).

Manipur: Sirohifura, 8000 ft. (Watt no. 6465–type of var. *lanceolata*, CAL, K).

N. Burma: Seinghki Wang, 5000 ft. (K.-Ward no. 6714, E); Valley of Naungchaung, Lashi County (K.-Ward no. 1579, E); Laikam, Myitkyina (Kermode no. 17075, fl., K).

China. Yunnan: Kiukiang Valley, 1700 m (T. T. Yü no. 19402, E).

Tonkin: Chapa, 1500 m (Pételot no. 3126, US, NY; no. 5679, A); ibid. (Hayata, Jun. 21, 1917, fr. red-purple, TI).

Distr. Eastern Himalaya (C. Nepal to Bhutan, alt. 2000–3300 m), Assam, Manipur, N. Burma, W. China (Yunnan), and N. Tonkin.

The Himalayan plants are clearly distinguished from typical *H. japonica* of Japan by elongate and long-caudately acuminate leaves often with more lateral veins and with sharp (but not long-aristate) teeth, less-branched stipules, smaller often purplish flowers, always red ripe fruits, and are diploid. They also differ from typical *H. chinensis* by broader and closely serrate leaves with long-caudate apex and with conspicuous veins elevated beneath, and shorter pedicels of male flowers. The leaves of *H. japonica* of Japan are strictly deciduous, but in *H. himalaica* and *H. chinensis*, some leaves are persistent during mild winter.

Rehder (1916) first suggested that the fruits of the Himalayan specimens are red, and this fact has been verified by our field observations in Eastern Himalaya since 1960 (see Plate 5a, b). He also referred the Chinese specimens with red fruits from Szechuan to *H. himalaica*. Handel-Mazzetti (1933) noticed that they somewhat differ from typical *H. himalaica* but included the Chinese specimens even with linear-lanceolate leaves in *H. himalaica*. In our opinion, however, the Szechuan plants mostly belong to *H. chinensis*.

H. himalaica, *H. chinensis* and *H. japonica* meet in Yunnan of West China. It is true that some puzzling intermediate forms occur there, and it is difficult to identify some herbarium specimens from Yunnan and Szechuan. Handel-Mazzetti suggested the occurrence of a natural hybrid between *H. himalaica* and *H. japonica*. At present we cannot settle the problem, and it is essential to carry out careful observations in the field of the district, and cytological studies on the plants in question. West China is surely the secondary centre of differentiation of the genus.

2a) *H. himalaica* var. **parvifolia** H. L. Li in Journ. Arnold Arb. **25**: 310 (1944)–Fang in Act. Phytotax. Sin. **1**: 169 (1951). [Pl. 21a]

Leaves lanceolate 2–5.5(–7) cm long 5–12(–20) mm wide, caudate-acuminate at the apex, cuneate at the base, minutely serrate, old leaves thickish and slightly lustrous, lateral veins conspicuously elevated beneath.

Specimens examined:

China. Yunnan: Mts. of Londjire, 15–16000 ft. (Rock no. 8871, fl. ♂-type, A, US); Mengze, 5000 ft. (Henry no. 9032C, K, E, A); Pe-long-tsin, 3200 m (Maire no. 134, E); Weisi Hsien (Wang no. 67959, A).

The exact taxonomic status of this variety is uncertain. It may be only a small-leaved form of *H. himalaica*, or it may be related to *H. chinensis*. Henry no. 9032C from Yunnan seems to agree with var. *parvifolia*, but Henry nos. 9032 & 9032A resemble a broad-leaved form of *H. chinensis*.

3) **Helwingia chinensis** Batalin in Act. Hort. Petrop. **13**: 97 (1893)–Harms ex Diels in Engl., Bot. Jahrb. **29**: 505 (1900), p.p.–Wangerin in Engl., Pfl.-reich IV-229 (Ht. 41): 37, f. 8 (1910)–Rehder in Sarg., Pl. Wilson. **2**: 571 (1916), p.p.; Bibl. 495 (1949)–Hand.-Mzt., Symb. Sin. **7**: 688 (1933), p.p.–Fang in Act. Phytotax. Sin. **1**: 170 (1951), p.p.–Hara, Fl. E. Himal. 646 (1966)–Icon. Cormophyt. Sin. **2**: 1110, f. 3950 (1972).

var. **chinensis.** [Pls. 22–24, 26b. Fig. 77a–c, f, g, j–l]

H. chinensis var. a. *genuina* et b. *longipedicellata* Wangerin in Fedde, Rep. **4**: 337 (1907).

H. chinensis var. *macrocarpa* Pampanini in Nuov. Giorn. Bot. Ital. n.s. **17**: 681, f. 16a (1910)–Rehder, l.c. 571 (1916).

H. himalaica var. *stenophylla* Merrill in Brittonia **4**: 137 (1941)–Li in Journ. Arnold Arb. **25**: 310 (1944); in Brittonia **1**: 96 (1948).

Leaves linear-lanceolate–*lanceolate* 4–15 cm long *4–20 mm wide* long-attenuate to the apex, *cuneate* or obtuse and often entire at the base, *remotely serrate* with *short* suberect *callose-tipped teeth*, sometimes persistent subcoriaceous, *lateral veins obscure*, smooth beneath; petioles 0.5–4 cm long; stipules generally *filiform*. Male flowers 3-4 mm in diameter; pedicels *capillary* 2–15(–25) mm long. Fruits *red* when ripe 5-9 mm in diameter, stones 5–6 mm long.

Representative specimens:

N. Burma. Ngawchang Valley, 5–6000 ft. (K.-Ward no. 63, young fr.–type of *H. himalaica* var. *stenophylla*, A, NY); without precise locality (K.-Ward no. 324, BM); Chimi-li Maikha–Salwin Divide (Forrest nos. 24967 & 25408, E, K).

China. Yunnan: E. flank of Tali Range (Forrest no. 4609, E; no. 4610, K, E*); W. of Tengyueh (Forrest no. 7554, fr. red, K); East of Tali Range (Forrest no. 9828, K, E); Mekong–Salwin Divide (Forrest no. 20395, fr. crimson, K*); without precise locality (Forrest no. 29073, E); Ta Tsin Teou (P. S. Ten no. 126, A; no. 127, E, US*; no. 369, E); Shunning, Holungtan, 2950 m (T. T. Yü no. 16202, E*).

Szechuan: Wushan (Henry no. 6719A, CAL–isosyntype of *H. chinensis*); Kuan Hsien (S. S. Chien no. 5684, E); Mt. Omei (H. C. Chow nos. 8295 & 9924, fl., A); Omei Shan (W. P. Fang no. 7882, K); Kikiang Hsien (Fang no. 1334, E). W. Szechuan (E. H. Wilson no. 4471, K, BM*).

Kansu: Kaon kia ho et Lao ling (Licent no. 5037, BM, K).

Kweichou: without precise locality (Cavalerie ann. 1905, E).

Hupeh: Feng (Henry no. 6719, K, BM, GH, US); S. Patung (Henry no. 6719B, K, E); Ichang (Henry no. 5127, K, TI); Hsing-shan Hsien (E. H. Wilson no. 172, K, BM, E, A); Patung (Chow no. 133, E; no. 613, E*).

Distr. N. Burma and W. & C. China (Yunnan, Szechuan, S. Kansu, Kweichou, Hupeh).

Typical *Helwingia chinensis* is characteristic (Pls. 22 & 23) in having narrow-lanceolate coarsely serrate thickish leaves with obscure veins, less laciniate stipules, longer filiform pedicels of male flowers, and red fruits.

Rehder (1916) referred such specimens with black fruits as Wilson no. 4472 to *H. chinensis*, hence Handel-Mazzetti (1933) and Fang (1951) considered the fruits

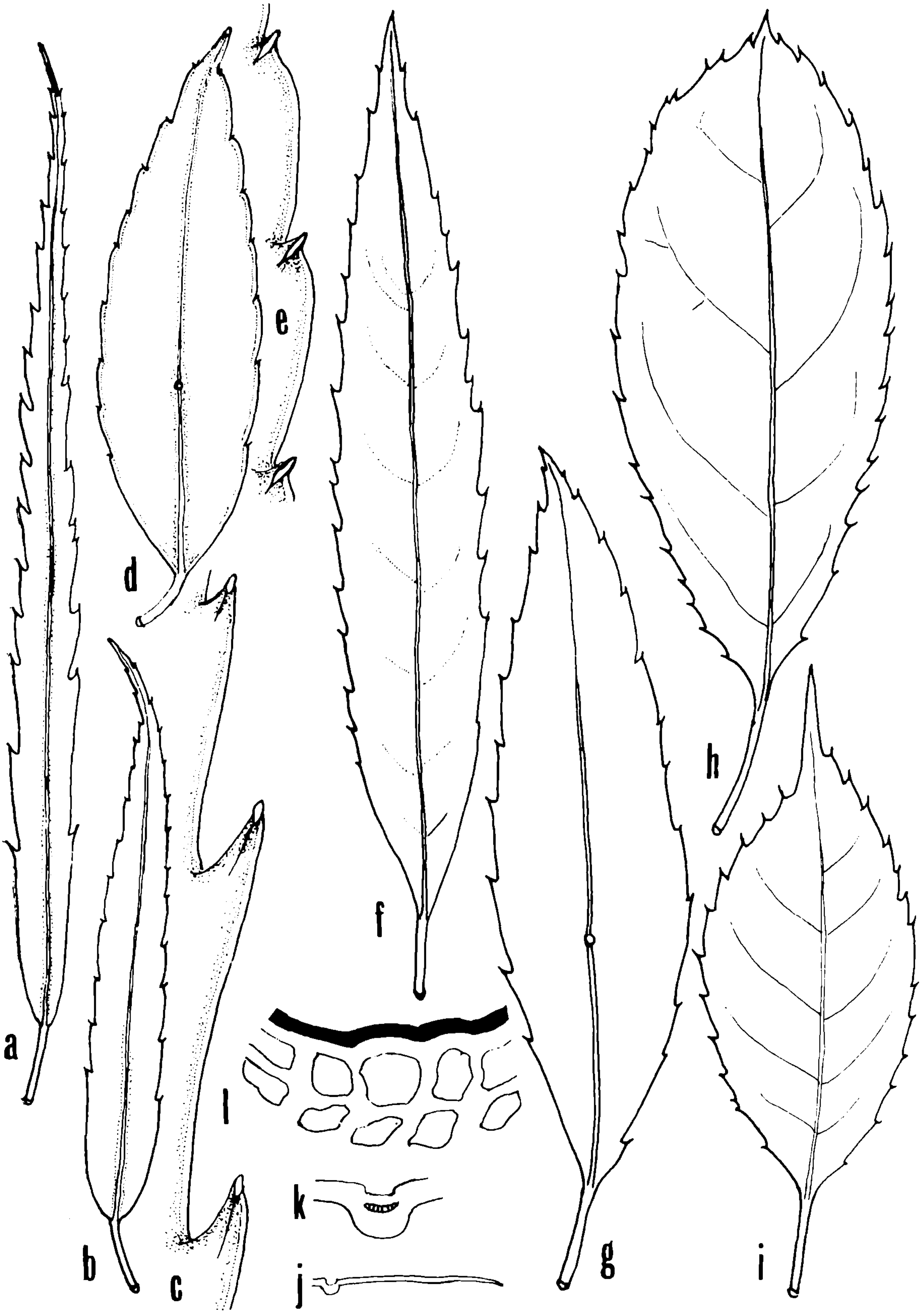

Fig. 77. *Helwingia chinensis* Batalin (a–c, f, g, j–l) and its var. *crenata* (Lingelsh.) Fang (d, e, h, i). Leaves, × 1. a. Mt. Omei (Chow no. 8295). b, c. Mt. Omei (Chow no. 9924). d, e. Hupeh (Chun no. 3741). f, g. Hupeh (Chow no. 133, E). h, i. Kwangsi (Steward & Cheo no. 382). j. Cross section of leaf (Chow no. 9924), × 3. k. Cross section of midrib of leaf. l. A part of the upperside of k, mag.

of *H. chinensis* as black. However, typical *H. chinensis* has red fruits, as clearly noted on the specimens Henry no. 6719.

The leaves are especially variable in *H. chinensis*. Some specimens cited above marked with * have lanceolate leaves, but branches with linear-lanceolate and lanceolate leaves are sometimes mixed in the same collection, for example E. H. Wilson no. 172 (Pl. 24a). While some others such as Hupeh (Chow no. 133) (Pl. 24b), Yunnan (Ten no. 126), and Szechuan (Fang no. 1334), have longer narrow lanceolate leaves 7–15 cm long and 11–22 mm wide.

3a) *H. chinensis* f. **megaphylla** Fang in Act. Phytotax. Sin. **1**: 172 (1951). [Pls. 21b, 26a]

Leaves larger broad lanceolate 10–17 cm long 2.5–5 cm wide thinner herbaceous, lateral veins 6–7-pairs visible, teeth small. Fruits 1 cm in diameter.

Specimen examined:

China. Kiangsi: Hong Shan, 900 m (L. Gressitt no. 1514, fr. green–type, A, BM, E).

This form has much larger and thinner leaves with many small teeth and distinct lateral veins. This interesting entity needs further studies at the habitat.

A specimen from Yunnan (T. T. Yü no. 19402, E) resembles this form in leaves, but it will be a form of *H. himalaica*. Another specimen from N. Burma (Forrest no. 29726, E) (Pl. 26b) also has large leaves attaining 20 cm long and 4 cm wide, but its leaves are more elongate with more sharp teeth, and can be considered as an extreme form of *H. chinensis*.

3b) *H. chinensis* var. **crenata** (Lingelsh.) Fang in Act. Phytotax. Sin. **1**: 171 (1951). [Pl. 25. Fig. 77d, e, h, i]

H. crenata Lingelsheim ex Limpricht in Fedde, Rep. Beih. **12**: 453 (1922)–Hand.-Mzt., Symb. Sin. **7**: 688 (1933)–Chun in Sunyats. **4**: 246 (1940).

H. himalaica var. *crenata* (Lingelsh.) Li in Journ. Arnold Arb. **25**: 310 (1944).

Leaves lanceolate–*ovate-lanceolate* rarely elliptic 5–8(–10) cm long *1.2–3*(–4) *cm wide*, acute or acuminate at the apex, obtuse or roundish at the base, *remotely serrate*, teeth short depressed or sometimes coarse and sharp, smooth beneath, lateral veins 5–7-pairs *obscure*; petioles 5–15 mm long. Fruits *red* when ripe.

Representative specimens:

China. Szechuan: Yangtse ling, Kwan Hsien, 1400 m (Limpricht no. 1286A–type, photo in A); Kuan Hsien (S. S. Chien no. 5682, BM, E); Kuan Hsien (Fang no. 1339, E; no. 2022, K, E).

Yunnan: Mekong–Salwin Divide (Forrest no. 14686, fr. scarlet, E); Szemao (Henry no. 11992B, fr. red, E).

Kwangsi: Lao Shan, Ling-yun Hsien (Steward & Cheo no. 382, fl., BM).

Hupeh: Liang Aung Gon, 4500 ft. (Chun nos. 3741 & 3869A, fr. bright red, A); Ichang (Henry no. 4504, K); Nanto (Henry no. 5282A, K); S. Wushan (Henry no. 5282B, K); without precise locality (E. H. Wilson no. 635, K, E).

Distr. W. & C. China (Szechuan, Yunnan, Kwangsi, Hunan, Hupeh).

We have examined only a photograph of the type of *H. crenata*. It seems to be a broad-leaved race of *H. chinensis*, as suggested by Fang. But it also seems to be related to *H. omeiensis* var. *oblanceolata*.

4) **Helwingia omeiensis** (Fang) Hara et Kurosawa, stat. nov.
[Pls. 27, 29a, b. Fig. 78a–f]

H. himalaica f. *omeiensis* Fang in Act. Phytotax. Sin. **1**: 169 (1951).

Shrubs 1–4 m high. Leaves *broad oblanceolate*-oblong 5–14 cm long 1.5–4.5 cm wide, acuminate at the apex, *cuneate* and entire at the base, serrate, teeth cuspidate *callose-tipped* often *small* and depressed, semipersistent *thick* and *coriaceous*, whitish and *smooth beneath*, lateral veins 5–6-pairs visible when dry but *not distinctly elevated* nor impressed, petioles 0.5–4 cm long. Pedicels 2–8 mm long. Ripe fruits globose *black* 7–10 mm across.

Specimens examined:

China. Szechuan: Mt. Omei, 1200 m (Fang no. 12621, Jul. 28, 1938, fr.–isotype, A, BM); ibid. 4500–5000 ft. (Fang no. 2620, fr., K, E); ibid. 4000 ft. (Faber no. 159, ann. 1887 & 1888, fr., K); ibid. (E. H. Wilson no. 4942, fl., K, BM); ibid. 900–1800 m (Chow no. 8236, Aug. 25, 1938, fr. black; no. 9934, fl. ♀ & no. 11683, fl. ♂, A); ibid. 900 m (Chiao & Fang no. 405, Aug. 24, 1938, fr. purplish black A).

Distr. China (Szechuan: Mt. Omei).

The fruits are noted as black on the labels of the specimens, Chow no. 8236 and Chiao & Fang no. 405, and those of Fang no. 2620 and Faber no. 159 also seem to be black. As compared with *H. himalaica* and *H. chinensis* var. *crenata*, the leaves are much thicker and coriaceous, cuneate at the base, with obscure lateral veins, and the fruits are black when ripe. The petals of female flowers of the specimen, Chow no. 9934, are narrow and oblong, but it is doubtful if this character is stable in this species.

4a) *H. omeiensis* var. **oblanceolata** (S. S. Chien) Hara et Kurosawa, stat. nov.
[Pls. 28, 29c–e. Fig. 78g]

H. chinensis f. *oblanceolata* S. S. Chien in Sinensia **2**: 102 (1932)–Fang in Act. Phytotax. Sin. **1**: 172 (1951).

Leaves *broad oblanceolate* 5–11 cm long 1.5–4 cm wide, caudate-acuminate at the apex, *cuneate* at the base, serrate with *small* obliquely ascending or depressed *pointed teeth*, *thinner*, lateral veins 6–7-pairs *distinct beneath* when dry, petioles 0.5–2.5 cm long. Fruits *black*.

Specimens examined:

China. Yunnan: Lunguan, Taron–Taru Divide, 2300 m (T. T. Yü no. 20017, E).

Kweichou: Tungtze, 400 m (Y. Tsiang no. 4966, May 19, 1930, young fr.–isotype, K, E, A, US, NY); Liang Fang Yah (Steward, Chiao & Cheo no. 23, fr. black, BM).

Kwangsi: without special locality (C. Wang no. 41043, fr., A).

Hunan: Yun-shan (T. H. Wang no. 121, fl., E, A); Ma-ling-tung (Fan & Y. Y. Li no. 610, BM).

Distr. West China.

This variety shows some intermediate characters between *H. omeiensis* and *H. chinensis* var. *crenata.*

W. Szechuan (E. H. Wilson no. 4472, A) is a doubtful specimen, and its fruits are black but its leaves are similar to those of *H. chinensis* var. *crenata.*

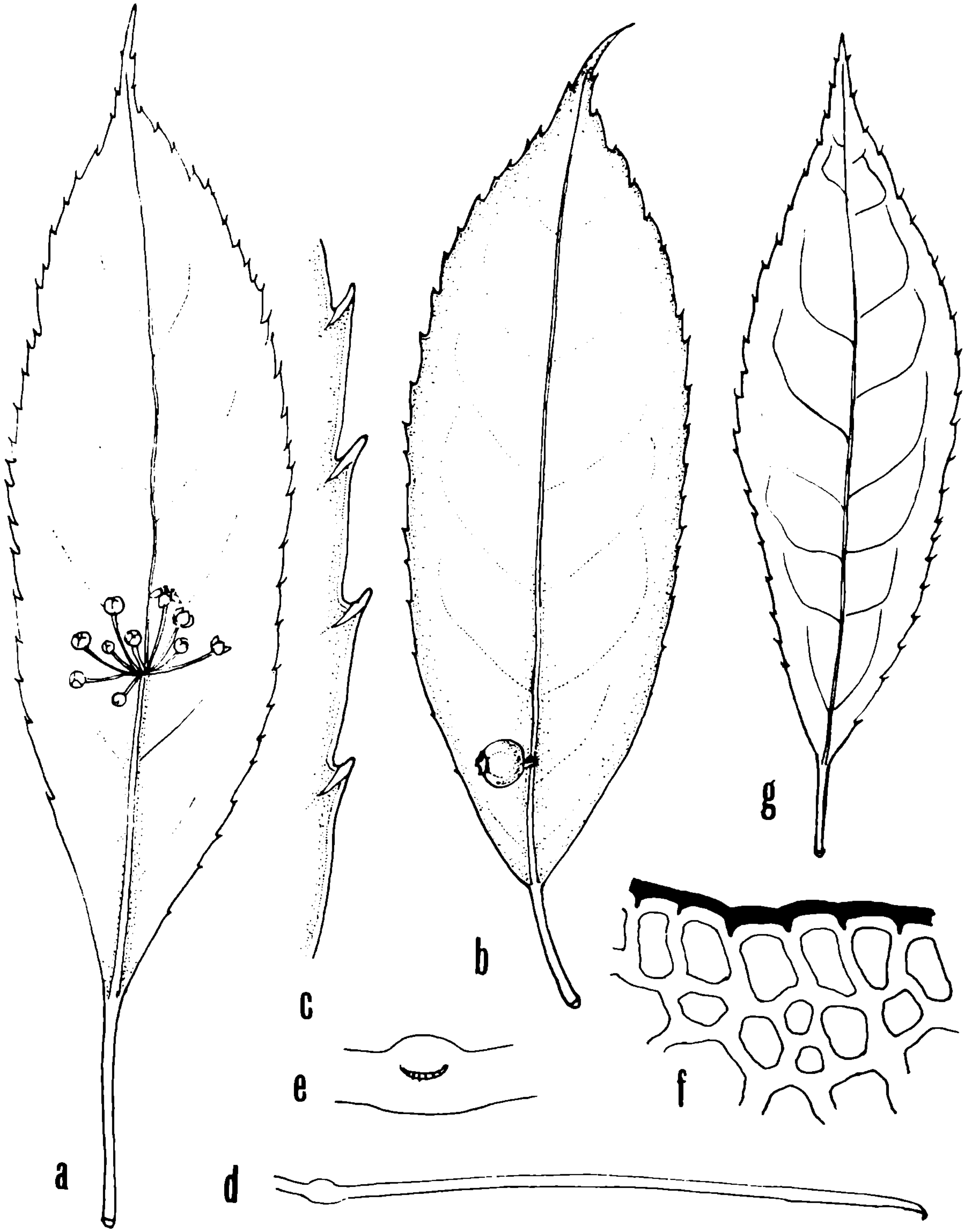

Fig. 78. *Helwingia omeiensis* (Fang) Hara et Kurosawa (a–f) and its var. *oblanceolata* (Chien) Hara et Kurosawa (g). a, b, g. Leaf, ×1. c. Leaf-margin, ×5. a, c. Mt. Omei (Chow no. 11683). b. Mt. Omei (Chow no. 8236). g. Kweichou (Tsiang no. 4966). d. Cross section of leaf, ×3. e. Cross section of midrib of leaf. f. A part of the upperside of e, mag.

Excluded species

Helwingia Argyi Léveillé et Vaniot in Bull. Herb. Boiss. ser. 2, **6**: 506 (1906) =*Stemona japonica* (Blume) Miquel.

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VEGETATION SURVEY OF CENTRAL NEPAL

by

Hiroo Kanai, Pushpa Ratna Shakya, and Tirta Bahadur Shrestha

In 1970, we performed a series of vegetation survey on various types of forests in various places of central Nepal. Our purpose was to make clear quantitatively the change of vegetational compositions in central Nepal from south to north. Such a survey has not hitherto been done in Nepal, though many observations on vegetation have been reported. This paper deals with a part of the results of our survey.

We wish to express our gratitude to Dr. P. R. Pande, Department of Forest and Dr. P. N. Suwal, Director, Department of Medicinal Plants, both in H.M.G. of Nepal, who conducted this vegetation survey. Thanks are also due to Dr. T. Suzuki, Oita University, Japan, for his kind advice on our field work. This work is a part of the technical aid provided by the Government of Japan to His Majesty's Government of Nepal.

Method of Survey

The places we surveyed were selected in the belt crossing central Nepal south to north through Kathmandu in order to study the climatic correlation of vegetation in central Nepal (Fig. 79 and Table 1). The sample plots were carefully selected to represent the typical natural forest. The size of quadrat was usually 10 m × 10 m for tree layers, and at most 6 quadrats were laid side by side if the

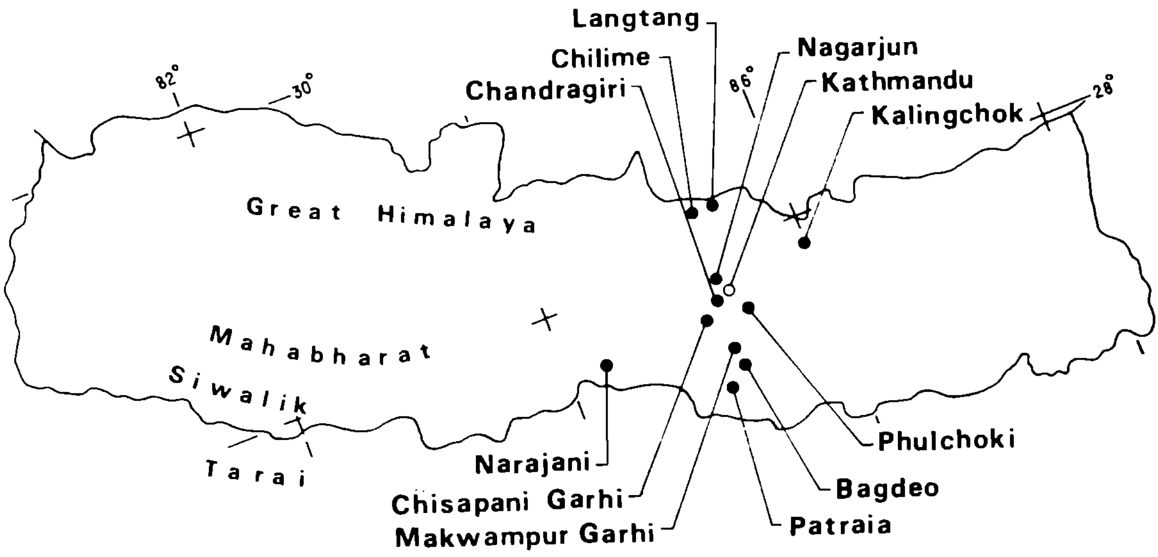

Fig. 79. Surveyed Plots.

circumstances allowed. Sometimes, a 20 m × 20 m quadrat was used when the 1st layer was very high and the place was horizontal. Three 1 m × 1 m quadrats were laid in each larger quadrat to survey the herb layer. The composing species in each quadrat were identified at the place as far as possible. Otherwise, the sample was numbered and taken to our laboratory for identification. We tried to collect good specimens of plants in the quadrat for future proof, but sometimes failed to get them because the height of the tree was too great or flower or fruit was out of season. Coverage of each species in each layer was recorded with ten-graded number corresponding to each ten percent. Altitude of the plot was measured with a Thomen Altitude Meter. Exposure and gradient of the plot were measured with a clinometer. Height of tree layers was measured with a Topcon Hypsometer K-type. Light intensity was measured with a Seconic Auto-leader III and was recorded in light value at ASA 100 as we did not have a meter with lux scale. Relative light intensity was calculated by the following formulae:

$$\log R = 2 - 0.301d$$
$$d = b - c$$

R . . . Relative light intensity (%)
b . . . Light value outside the forest
c . . . Light value inside the forest

Measurement of light intensity was sometimes impossible because of bad or changeable weather or because we could not find an open place outside the forest nearby. Girth of tree trunks at breast height was measured with a measuring tape. Basal Area (BA) and its percentage of land area (BAR) were calculated by the following formulae:

$$BA = \frac{1}{4\pi} \times \left(\sum_{n=1}^{p} G_{an}^2 + \sum_{n=1}^{q} G_{bn}^2 + \sum_{n=1}^{r} G_{cn}^2 + \ldots\ldots\right)$$

G . . . . . . Girth at breast height in cm
a, b, c . . . Species
n . . . . . . Individual number of each species

$$BAR = \frac{BA}{\text{Size of surveyed area in cm}^2} \times 100$$

Our difficulty was in finding good natural forests. In most cases, the forest floor was quite disturbed by grazing or clearing of litter by villagers. In other cases, there was no place without a single stump and sometimes the forest floor had evidence of a past fire. In the middle altitudes, we could not find even a single patch of forest because of extensive cultivation. In the alpine zone, summer grazing strongly affected the vegetation. Actually, it was impossible to find a sample plot with natural conditions, and consequently, we had to survey the plots that we believed to be least affected.

Forest Types

i) *Shorea robusta* forest

Forest of *Shorea robusta* covered the lower elevation of the Himalayan foothill and the Gangetic Plain. *Shorea robusta* was overwhelming everywhere. The 2nd layer of the forest was not developed. Two types of *Shorea* forest, montane and plain, could be distinguished:

1) Plain *Shorea robusta* forest

This forest was observed widely in the Terai area and at the foot of Siwalik hills up to 300 m in altitude. Coverage of the 1st layer was quite dense. *Bauhinia Vahlii* and *Combretum decandrum* were common climbers.

The undergrowth consisted of many species. Among them, the prominent species were *Sterculia villosa* and *Imperata cylindrica* in Patraia and *Clerodendrum infortunatum* in Narajani. *Sterculia* was likely to appear in damper places than *Clerodendrum.* Seedlings of *Shorea robusta* were common though the coverage was scarce.

2) Montane *Shorea robusta* forest

This forest covered the hilly areas of Siwalik hills from 200 m to 1000 m in altitude. Composition of the 1st layer was similar to that of the plain *Shorea* forest but the proportion of *Shorea* was much greater at higher elevations especially on the south-facing slopes. The shrub layer was dominated by *Phoenix humile* and the herb layer by *Carex cruciata.* Seedlings of *Dendrocalamus* sp. dominated on north-facing slopes in place of *Carex cruciata.*

ii) Other Forest Types in Plain Region

1) *Terminalia tomentosa* forest

In depressed places that are marshy in the rainy season, *Shorea robusta* was reduced its number and *Terminalia tomentosa* and *Carreya arborea* increased. As undergrowth, neither shrub nor herb layers was developed well.

2) *Acacia eburnea* forest

Successional process from the diluvial plain to *Shorea* forest was of much interest. In some places, *Acacia ebrunea* was the first settler. Undergrowths were weedy; *Elsholzia* sp. occupied most part of the shrub layer, and *Ageratum conizoides* dominated in the herb layer. *Dalbergia* sp. was the first settler in other place. There were several intermediate types between *Acacia* or *Dalbergia* forests and *Shorea* forests, though they were not surveyed at this time.

iii) *Schima wallichii* forest

Schima wallichii forests are located above the montane *Shorea* forest. Around Makwanpur Garhi, at 800–900 m altitude, *Shorea* forests were observed on south- and east-facing slopes and *Schima* forests on north- and west-facing slopes. Coverage of the 1st layer was 60–80%. *Castanopsis tribuloides, Machilus duthiei, Juglans regia, Quercus spicata,* etc., had larger proportions in some quadrats, though they were not common. The second layer was negligible. The shrub layer was not developed well, though it consisted of a fairly large number of species. The herb layer was developed in Makwanpur Garhi (Plot No. 77) and Nagarjun lower plots (Plot Nos. 1–3). *Carex* sp. and mosses were dominant in the former plot but there was no commendable dominant species in the latter. The difference may be partly due to the difference of the time of survey. On the other hand, the herb layer was not developed well in the Nagarjun higher plot (Plot No. 4). The upper limit of the *Schima* forests was 1800–1900 m in altitude.

A forest of *Juglans regia* was developed on the north-facing concave slope (Plot

No. 2). It was considered as a local modification of the *Schima* forest affected by topography.

iv) *Pinus* forest

This is a localized forest on south-facing slopes in lower to middle altitudes up to 2000 m. *Pinus roxburghii* and *P. griffithii* were the dominant species. The former appeared at lower elevations than the latter. Subsidiary components were usually negligible. But in Nagarjun (Plot No. 9), there was a second layer consisting purely of *Schima wallichii*, suggesting the succession to *Schima* forest from *Pinus*. The forest floor was covered with litter and well grazed. The shrub layer was not well developed. In the herb layer, the dominant species was *Pogonatherum paniceum* in *Pinus roxburghii* forests and *Selaginella involvens* in *P. griffithii* forests.

v) Evergreen Oak forest

Generally, this type of forests developed on the north- or west-facing slopes. The south-facing slope was usually occupied by *Quercus semecarpifolia*, *Rhododendron arboreum* or *Quercus lanuginosa* forests. The lower limit of this forest was probably 1700 m in altitude. *Q. lineata* was common in most of the forests; *Q. glauca* was subsidiary, and *Q. lamellosa* was dominant at a certain place. The second layer had considerable coverage but the composing species were different from place to place. The shrub layer was fairly dense, *Listea pulcherrima* and *Machilus* sp. being most common. Usually they were the sprouts from cut stumps suggesting human disturbance. Another fairly common species was *Arundinaria maling*, though its coverage was quite scarce. The herb layer was dense. *Oplismenus compositus* was dominant in Chisapani Garhi, *Strobilanthes atropurpureus* and *Carex cruciata* in Phulchoki and *Ainsliaea pteropoda* in Chandragiri.

vi) Various types of broad-leaved forests

Local substitutions for evergreen oak forests consisting of broad-leaved species were observed in several places. The dominant species was different from place to place. *Machilus duthiei* was dominant in Plots No. 8 and 49, *Lindera bifaria* in Plot No. 34, and *Symplocos pyrifolia* in Plots No. 103–105. *Carpinus viminea* was dominant in the secondary forest developed after disturbance (Plot No. 67). *Sarcococca hookeriana* was dense in several plots as a shrub component. The herb layer was usually well developed and *Carex* spp. were dominant in most places.

vii) *Quercus semecarpifolia* forest

This forest was widely observed from 2000 to 3000 m in altitude. The 1st layer was dense and consisted exclusively of *Q. semecarpifolia.* The 2nd layer was not developed well, but it was denser in the lower than in the higher altitude. The shrub layer showed similar features and tendencies in different plots, though it did not have apparent dominant species, but *Arundinaria* increased at lower altitudes. The herb layer consisted of an average of 10 species and was dense. The dominant species were different in different plots. They were *Athyrium* sp. and *Ainsliaea pteropoda* in Chilime, *Bistorta amplexicaulis* and *Strobilanthes nutans* in Langtang, *Strobilanthes atropurpureus* in Phulchoki and *Hedychium ellipticum* in Chandragiri. This forest mixed with evergreen oak forests at lower altitudes and with *Tsuga* *dumosa* forests at higher altitudes.

viii) Dry Forest

There were two types of dry forest on the south- or west-facing slopes, in which *Rhododendron arboreum* forests were rather widespread, and *Quercus lanuginosa* forests were quite localized. A forest dominated by *Lyonia ovalifolia* was observed in Plot No. 98. It was considered as a variety of *Rhododendron arboreum* var. *campbelliae* forest.

1) *Rhododendron arboreum* forest

The altitude of this forest was the same as that of evergreen oak forest but this developed usually on south- or west-facing slopes. The forests were disturbed very much by human activity. *R. arboreum* formed the dense 1st layer, *Lyonia ovalifolia* was observed very sparsely in the forests. The average height of the 1st layer was 8–9 m and there was no 2nd layer. The shrub layer consisted of many species in which *Myrsine semiserrata*, *Daphne bholua*, *Eurya acuminata*, or *Arundinaria maling* was dominant from place to place. The herb layer was fairly well developed.

2) *Quercus lanuginosa* forest

This forest was localized on south- or west-facing steep slopes in the *Schima* and evergreen oak forest zones. The 1st layer consisted exclusively of *Quercus lanuginosa.* The 2nd layer was negligible in Nagarjun, but it was fairly developed in Phulchoki, consisting of *Lyonia ovalifolia*, *Quercus glauca* and *Rhododendron arboreum.* The shrub layer was scattered and did not have any dominant species. The herb layers were 30–50% in coverage. In Nagarjun, there was no dominant species, though there was an average of 11 species. On the other hand, in Phulchoki, the herb layer consisted of 6 species in average and *Ainsliaea pteropoda* dominated.

ix) *Abies spectabilis* forest

Abies forests were abundant from 3000 m to 3300 m. They were considerably disturbed especially near villages or kharkas as the timbers were used for house building. The 1st layer consisted solely of *Abies spectabilis. Rhododendron arboreum* var. *campbelliae* was common as the 2nd layer, but *R. barbatum* was much more abundant and denser in Plot No. 54. *Daphne bholua* was common as shrubs in most of these forests. In the herb layer, *Elatostema obtusa*, *Carex* spp. and mosses were common and abundant.

x) *Tsuga dumosa* forest

Tsuga forests appeared near the lower limit of *Abies* forests in some places from 2700 m to 3000 m in altitude. In Plot No. 32, which was the only *Tsuga* forest surveyed in this report, the 2nd layer consisted of *Ilex dipyrena.* The shrub layer was scanty, but *Pieris formosa* was frequent. The herb layer was quite dense. *Strobilanthes* sp. was abundant with 30% coverage, and *Carex* sp. and mosses were subsidiary.

xi) *Juniperus* forest

Juniperus recurva was sometimes mixed in *Abies spectabilis* forests. In Gosainkund region, it formed a pure forest with a 30 m high crown with *Rhododendron* spp. in the 2nd layer. Plot No. 55 was located at the foot of a hill covered with an *Abies* forest. The second and shrub layers were lacking but the herb layer was dense. Mosses were dominant, and *Strobilanthes atropurpureus* was subsidiary. *Elatostema obtusa* showed considerable coverage.

xii) *Rhododendron arboreum* var. *campbelliae* forest

This forest developed from 2900 m to 3300 m in altitude. The crown was dense and *Rhododendron arboreum* var. *campbelliae* was the only dominant species. It also formed the 2nd layer in *Abies spectabilis* forests. Where places were once fired, such as Plot No. 112, *Rhododendron arboreum* var. *campbelliae* formed a dense 'crown' and *Abies* formed a very scattered 1st layer above it. In Chilime, *Arundinaria* sp. was observed as the shrub layer, and the herb layer was hardly developed. In Kalingchok, on the other hand, the shrub layer was hardly developed, and the herb layer was quite dense dominated by *Elatostema obtusa* with subsidiary mosses and *Carex*.

xiii) *Rhododendron campanulatum* forest

This forest was frequently found as the 2nd layer of *Abies spectabilis* forests near its upper limit, but generally it formed a dense thicket on the timber line. The forest did not have the 2nd and shrub layers. In the herb layer, mosses dominated

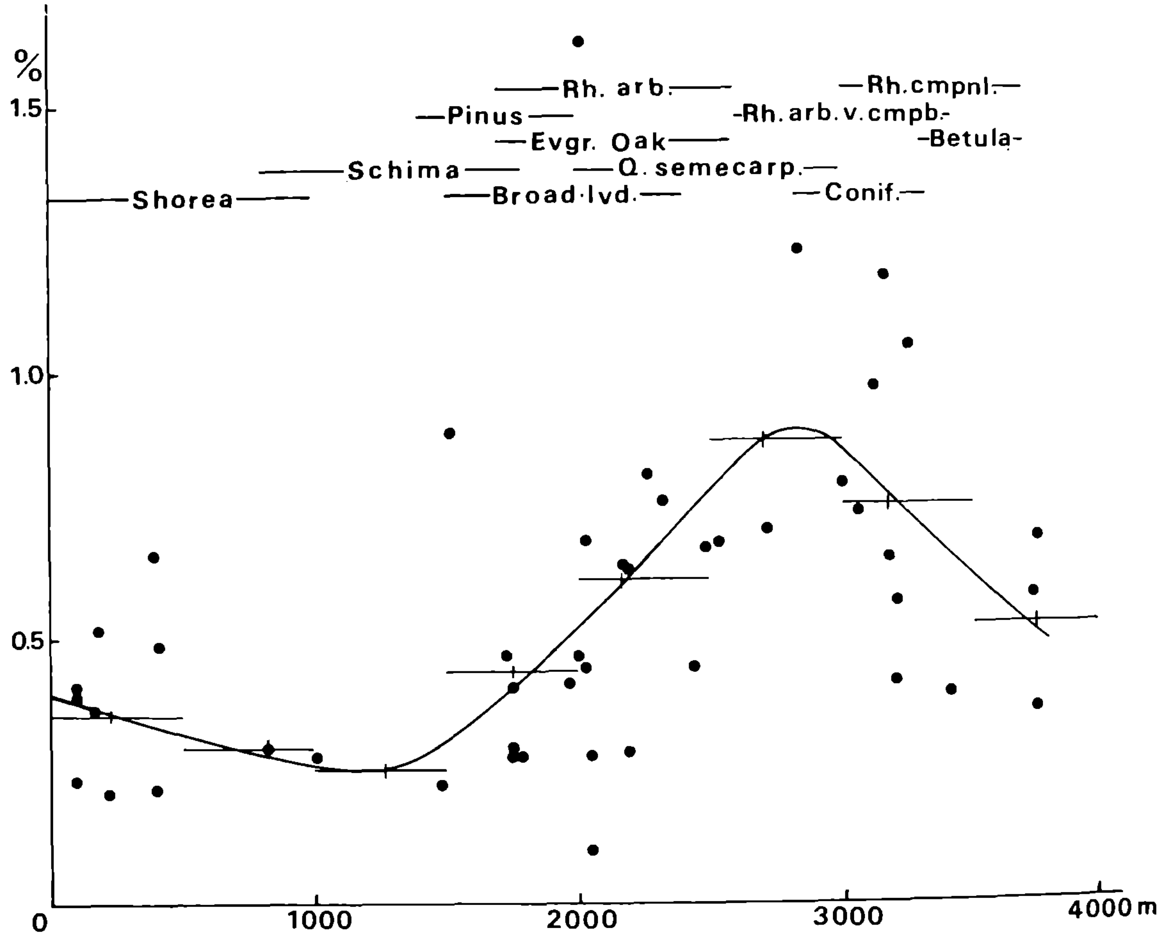

Fig. 80. Altitudinal distribution of the percentage of basal areas (BAR) and principal forest types. The horizontal bars crossed by a short line indicate the average basal area and the average altitude of plots for every 500 m.

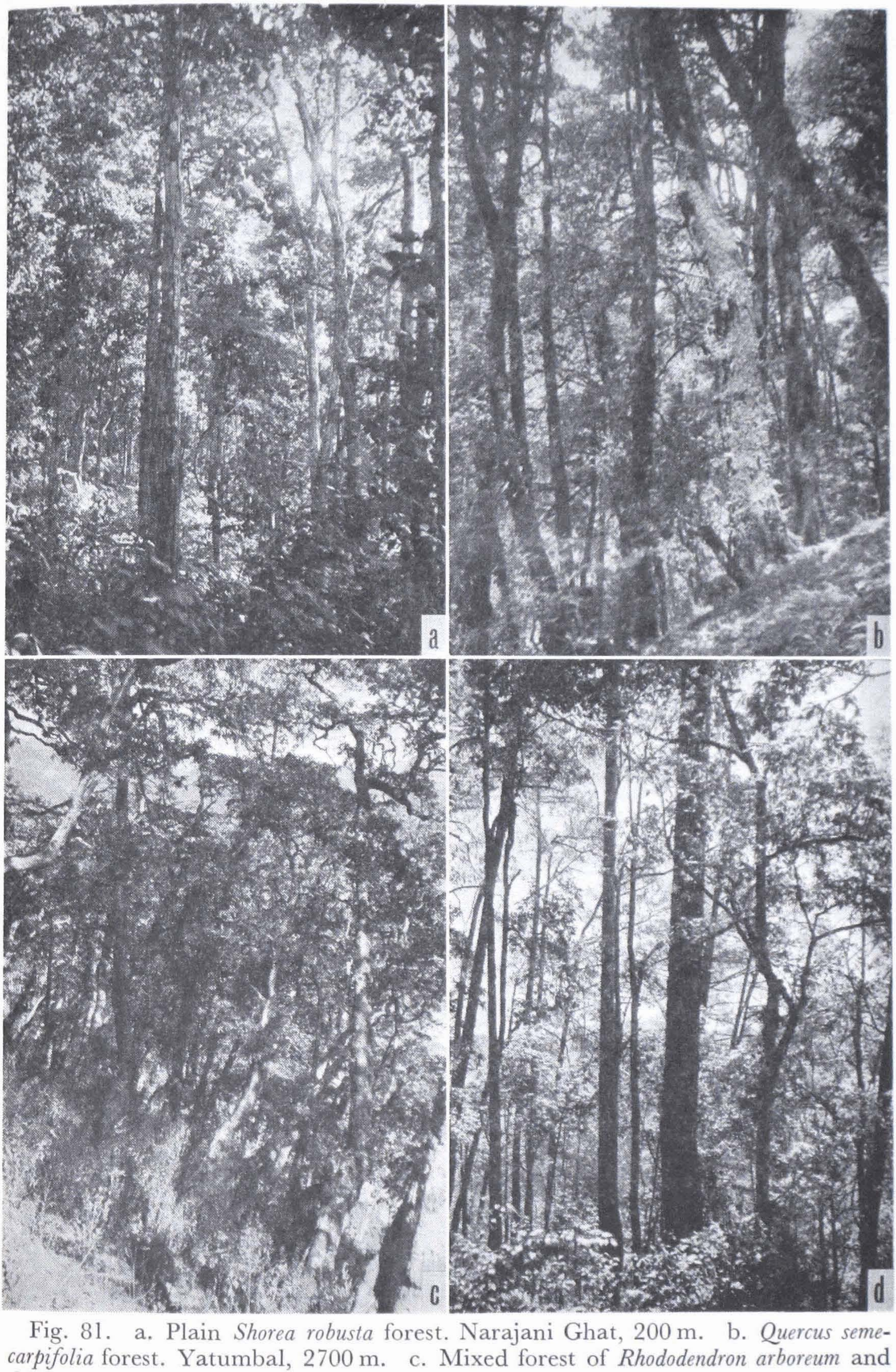

Fig. 81. a. Plain *Shorea robusta* forest. Narajani Ghat, 200 m. b. *Quercus semecarpifolia* forest. Yatumbal, 2700 m. c. Mixed forest of *Rhododendron arboreum* and *Quercus lanuginosa*. Bumro, 1900 m. d. Forest of *Pinus roxburghii* with *Schima wallichii* as the second layer. Nagarjun, 1500 m.

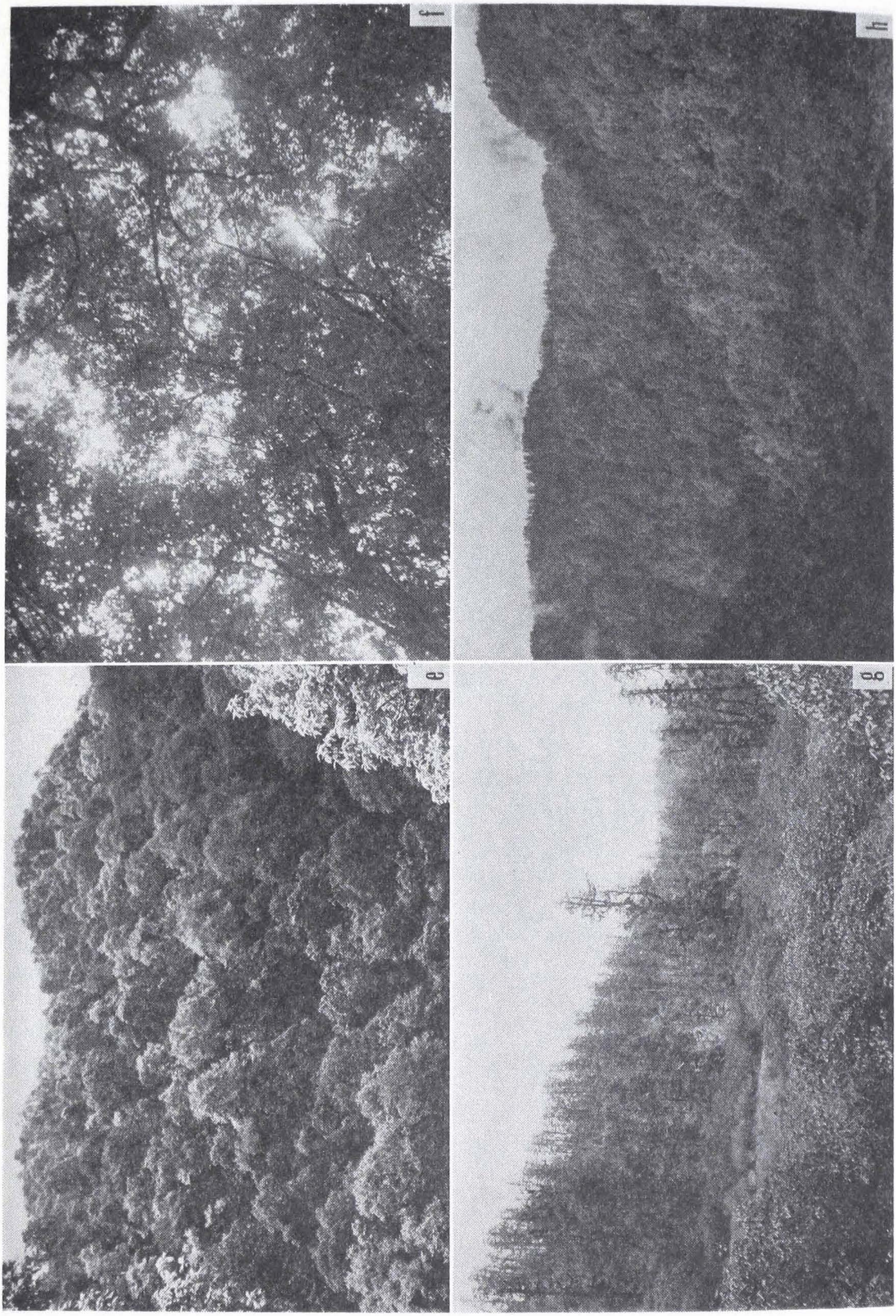

Fig. 82. e. Mixed broad-leaved forest. Nagarjun, 2000 m. f. Mixed broad-leaved forest. Para Gaon, 2400 m. g. Forest of *Abies spectabilis* and scrub of *Rhododendron campanulatum*. Tingoang, 3200 m. h. *Abies spectabilis* forest. Kalingchok, 3600 m.

in most places, but *Carex cruciata* dominated at lower altitudes. This type of forest was observed from 3000 m to 3700 m in altitude.

xiv) *Betula utilis* forest

This forest was observed in the zones of *Rhododendron arboreum* var. *campbelliae* forest and *Abies spectabilis* forest and was localized on north-facing slopes where the ground was filled with huge rocks. Coverage of the 1st layer was 80% in average consisting exclusively of *Betula utilis*. The second layer was lacking. The shrub layer mainly consisted of *Sorbus foliolosa*, *Lonicera* sp. and *Rhododendron campanulatum* in Langtang and of *Arundinaria* sp. in Kalingchok. Mosses dominated as ground cover everywhere; *Cacalia quinqueloba* was prominent in Langtang, and *Bistorta affinis* and *Senecio pteropodus* in Kalingchok.

Basal Area

The basal areas of various forest types from the subtropical to subalpine were surveyed for the first time in Nepal. They are shown in Table 57 and Fig. 80. The basal areas for every 500 m elevation are shown in Table 58. As it is clear in Fig. 80, the BAR has its maximum at ca. 3000 m alt. with a value of about 0.9%. The minimum of BAR is observed at ca. 1200 m with a value of about 0.25%. After this minimum, BAR shows a gradual increase toward lower altitudes. This phenomenon was first observed by our survey, though it is not certain whether this minimum is the result of human activity or natural tendencies because the number of plots surveyed was insufficient.

Table 1. List of surveyed plots and their environmental conditions arranged by numerical order of plot number.
(Size of quadrat 10m x 10m. 20m x 20m for the plots with double asterisk (**))

Plot No.	Quadrat No.	Date/ Month in 1970	Altitude m	Exposure	Gradient	Relative Light Intensity %	Place Name	Forest Type	Remarks
1	7	24/4	1530	S75E	40	57	Nagarjun	*Schima*	Soil dried, hard, light brown with less humus.
	8	"	1540	S70E	45	29	"	"	
2	9	"	1520	N30E	40	54	"	"	Concave slope. Stream appears in rain season. Litter cleared by villagers. Soil blackish brown, dried, soft with less humus.
3	10	"	1600	S85E	45	15	"	"	Shady stream side. Soil light blackish brown with less humus.
4	11–16	26/4	1790	N20E	35	25	"	"	Much litter on the ground. Humus not much.
5	17–20	28/4	2050	S80W	40	71	"	*Quercus lanuginosa*	Dried, somewhat rocky. Ground cleared by grazing.
7	22	"	2050	S30E	45	50	"	"	Soil light brown with some humus.
8	23	29/4	2000	N0E	40	23	"	Broad-leaved	Soil humid, black with rich humus.
	24	"	2020	N70E	35	23	"	"	Drier than the previous but still humid with rich humus.
	25	"	2010	N85E	40	31	"	"	Soil light reddish brown. Drier than the previous.
	26	"	2030	N40W	40	33	"	"	Soil black with rich humus.
	27	"	2020	N15E	40	33	"	"	Soil black, somewhat humid. Humus rich.
9	28	30/4	1520	S60E	25	62	"	Pine	Floor covered with fallen pine leaves. Soil drier, light brown with some humus.
	29	"	1530	S20E	40	76	"	"	
10	30	"	1480	S50W	40	81	"	"	Soil light brownish red without humus.
29	64	7/7	3690	S80E	33		Chilime	*Rhododendron campanulatum*	Rich in litter and humus.
30	65	"	3210	S7E	40		"	*Abies*	Located at the lower limit of the *Rhododendron* forest and mixed with upper part of *Abies* forest. Not typical. Rich in litter and humus.
31	66	"	3200	S5W	45	4	"	"	Rich in litter and humus.
32	67–72	"	2840	S20W	45		"	*Tsuga*	
33	73–78	8/7	2720	S20E	30		"	*Quercus semecarpifolia*	Size of trees is less than those on the upper slope but the coverage is denser here.
34	79–84	"	2330	S40W	35		"	Broad-leaved	Riverside. The floor very rocky with rich humus and litter.
35	91–92	14/7	3750	N	30	18	Langtang	*Betula*	Rich in humus.
36	93	"	"	N62E	43	10	"	"	More shady and humid than the previous plot with much litter and humus.
37	94	"	3740	N5E	35		"	"	More open than the previous plot. Somewhat disturbed. Rocky.
44	100–105	17/7	3000	S5W	40		"	*Quercus semecarpifolia*	Upper limit of the forest, developed on debris.
47	107	2/9	2040	N20W	45		Chisapani Garhi	Evergreen Oak	
48	108	3/9	1730	N44E	30		Chandragiri	Pine	Soil reddish with scarce humus.
49	109	4/9	1760	S	30		"	Broad-leaved	Reservior forest. Much disturbed recently and protected after disturbance. Soil red, gravelly, without humus.
50	111	"	2190	N90W	50		"	*Quercus semecarpifolia*	
51	112	4/9	2170	S10W	45		Chndragiri	Evergreen Oak	
52	113	"	2190	N30W	43		"	"	
53	114	24/9	3060	N55W	25	14	Kalingchok	*Rhododendron campanulatum*	Soil gray brown, sandy clay with rich humus. Trunks covered with mosses. Forest surrounding Kharka.
54	115–120	26/9	3120	S80E	25		"	*Abies*	
55	121	26/9	3180	N90E	15		"	*Juniperus*	Humus black. Tree branches covered with mosses.
56	122–124	26/9	3250	S10E	30		"	*Abies*	
59	130	27/9	3410	N10W	40		"	*Betula*	Ground rocky with much humus. Soil black brown.

Plot No.	Quadrat No.	Date/ Month in 1970	Altitude m	Exposure	Gradient	Relative Light Intensity %	Place Name	Forest Type	Remarks
60	131–133	"	3170	N90E	30		"	*Rhododendron arboreum* var. *campbelliae*	
61	134–139	19/10	2540	S25W	25		Phulchoki	*Quercus semecarpifolia*	Near the top. Rich in litter and humus.
62	140–145	20/10	2480	N30E	20		"	"	
63	146–151	21/10	2430	N20E	35		"	Evergreen Oak	
64	152–157	3/11	2030	N10E	50	11	"	"	Soil brown black, humid with much humus.
65	158	4/11	2020	N25E	45	17	"	"	
66	159–160	"	1970	S35W	45	17	"	*Quercus lanuginosa*	
67	161–162	"	1750	N20W	35	19	"	Broad-leaved	
68	163	"	1750	N35W	30	13	"	Evergreen Oak	Secondary forest.
69	164	5/11	2270	N25W	60		"	*Rhododendron arboreum*	Much disturbed.
70	165–166	5/11	2030	S60W	60		Phulchoki	*Rhododendron arboreum*	
71	167–168	14/11	400	S5E	20	29	Bagdeo	Montane *Shorea*	Ground scatteredly rocky. Soil whitish with hard grains. Litter scarce.
72	169	"	400	N15E	35	13	"	"	
73	170	"	420	S60E	40	29	"	"	
74**	171	15/11	100	Level		20	Patraia	Plain *Shorea*	
75**	172	"	100	"		14	"	"	Denser than the previous plot. Ground flooded in rain season. Undergrowth scarce and low.
76**	173	"	100	"		13	"	*Terminalia*	A depression. Marshy in rain season.
77**	174–175	16/11	1050	N5E	30	23	Makwampur Garhi	*Schima*	Fairy disturbed.
78**	176–177	"	820	N65E	30	22	"	Montane *Shorea*	Near the upper limit of *Shorea* forest.
79**	178	18/11	210	Level			Narayani	*Acacia*	On sandy and somewhat gravelly river bed.
80**	179	19/11	170	S70W	10	22	"	Plain *Shorea*	Soil pale brownish red, hard.
81**	180	"	180	N55W	5		"	"	
92	191	12/3	2180	N15W	45		Bumro	*Rhododendron arboreum*	Soil black with much humus.
93	192	"	2070	N30W	45	20	"	"	
94	193	"	2090	S70E	35	5	"	"	Much disturbed. Dried. Soil black with humus.
95	194	13/3	2020	S60E	35	35	Tandj	*Quercus lanuginosa*	Dried. Soil light brown with less humus.
96	195	"	2020	S40E	30	29	"	"	
97	196	"	2020	S80W	40	44	"	"	
98	197	14/3	2560	N80E	25	50	Nigale	*Quercus lanuginosa*	Rich in humus.
100	199	"	3020	N40E	25	25	Dobatya	*Rhododendron arboreum* var. *campbelliae*	Near the upper limit of *Rhododendron* forest. Rich in humus.
101	200	"	3010	S80E	40	31	"	"	Rich in humus.
102	201	"	3000	S80E	25	35	"	"	
103	202	15/3	2300	N30E	35	66	Rol Khane	Broad-leaved	Rich in humus.
104	203	"	2290	N30E	30	27	"	"	Rich in humus.
105	204	"	2300	N10E	15	35	"	*Symplocos*	Soil black. Rich in humus.
106	205	16/3	2450	N90E	25		"	*Rh. arboreum*	Disturbed very much.
107	206	"	2540	N30E	20	41	"	"	Rich in humus.
108	207	"	2660	N70E	25	19	"	*Rhododendron arboreum* var. *campbelliae*	Shady, humid and concave slope. Rich in humus.
109	208	"	2650	S70E	35	27	"	"	Drier and less shady than the previous. Rich in humus.
110	209	"	2660	N80E	30	46	"	Broad-leaved	Near the ridge.

Plot No.	Quadrat No.	Date/ Month in 1970	Altitude m	Exposure	Gradient	Relative Light Intensity %	Place Name	Forest Type	Remarks
111	210–211	17/4	3250	N90E	15	33	Kalingchok	*Abies*	Stream side. Mossy. Rich in humus.
112	212	"	3300	S50E	25	44	"	"	Concave slope. Rich in humus.
114	214	18/4	3400	S80E	35	50	"	*Rhododendron arboreum* var. *campbelliae*	Rich in humus. Trunks mossy.
115	215	18/4	3320	S70E	25	22	"	*Juniperus*	
116	216	18/4	3000	S60E	20	41	Kalingchok	*Rhododendron arboreum* var. *campbelliae*	Rich in humus.
117	217	3/5	3060	S75E	30	54	"	*Abies*	Soil light black with much humus.
118	218	"	3050	S90W	30	66	"	"	Soil light black with much humus.

Table 2. List of plots arranged by altitudinal order.
(Size of quadrat 10m x 10m. 20m x 20m for the plot with double asterisk (**))

Plot No.	Altitude m	Relative Light Intensity %	Tree				Herb		Place Name	Forest Type	Table No.
			No. of Species	Community Height m	Stem Density per ha	% of Basal Area	No. of Species	Community Height cm			
74**	100	20	10	31	375	0.3921	6	43	Patraia	Plain *Shorea*	3
75**	"	14	9	32	525	0.4054	5	30	"	"	3
76**	"	13	12	33	350	0.2371	5	40	"	*Terminalia*	7
80**	170	22	7	27	625	0.3652	5	23	Narayani	Plain *Shorea*	4
81**	180		4	27	700	0.5185	4	18	"	"	4
79**	210		9	21	400	0.2071	4	22	"	*Acacia*	8
71**	400	29	7	20	850	0.6593	6	23	Bagdeo	Montane *Shorea*	5
72	"	13	8	22	600	0.2137	5	23	"	"	5
73	420	29	9	15	1400	0.4848	6	27	"	"	5
78**	820	22	8	19	700	0.2920	5	22	Makwampur Garhi	Montane *Shorea*	6
77**	1050	23	4	20	300	0.2791	10	33	"	*Schima*	11
10	1480	81	1	22	300	0.2268	8	25	Nagarjun	Pine	12
2	1520	54	3	25		0.2268	11	23	"	*Schima*	9
9	1530	69	4	22	950	0.8852	4	19	"	Pine	12
1	1540	43	4	16			8	32	"	*Schima*	9
3	1600	15	4	20			10	28	"	"	9
48	1730		1	35	400	0.4654	16	5	Chandragiri	Pine	13
67	1750	19	6	17	950	0.2939	7	25	Phulchoki	Broad-leaved	23
68	1750	13	4	8	1300	0.2764	9	22	Phulchoki	Evergreen Oak	19
49	1760	1				0.4100			Chandragiri	Broad-leaved	22
4	1790	25	5	26	483	0.2799	7	23	Nagarjun	*Schima*	10
66	1970	17	7	16	1250	0.4153	6	23	Phulchoki	*Quercus lanuginosa*	36
8	2020	26	5	20	260	0.4698	9	27	Nagarjun	Broad-leaved	20
65	2020	17	4	14	700	1.6136	9	23	Phulchoki	Evergreen Oak	18
95	2020	35	3	17			5	30	Kalingchok	*Quercus lanuginosa*	37
96	2020	29	3	18			6	30	"	"	37
97	2020	44	1	12			8	20	"	"	37
64	2030	11	5	27	683	0.6809	12	32	Phulchoki	Evergreen Oak	17
70	2030		3	9	1050	0.4436	8	28	"	*Rh. arboreum*	31
47	2040		6	18			8	33	Chisapani Garhi	Evergreen Oak	14

Plot No.	Altitude m	Relative Light Intensity %	Tree				Herb		Place Name	Forest Type	Table No.
			No. of Species	Community Height m	Stem Density per ha	% of Basal Area	No. of Species	Community Height cm			
5	2050	71	3	10	600	0.2808	12	35	Nagarjun	*Quercus lanuginosa*	35
7	2050	50	1	11	300	0.1021	6	23	"	"	35
93	2070	20	3	7			13	30	Kalingchok	*Rh. arboreum*	32
94	2090	5	6	8			7	30	"	"	32
51	2170		2	18	1000	0.6377	7	27	Chandragiri	Evergreen Oak	15
92	2180		8	8			14	50	Kalingchok	*Rh. arboreum*	32
50	2190		8	18	300	0.2854	14	67	Chandragiri	*Quercus semecarpifolia*	27
52	2190		3	15	500	0.6294	11	40	"	Evergreen Oak	15
69	2270		4	11	900	0.8076	17	30	Phulchoki	*Rh. arboreum*	30
104	2290	27	8	10			12	30	Kalingchok	Broad-leaved	24
103	2300	66	10	7			11	30	"	"	24
105	2300	35	5	12			7	30	"	*Symplocos*	24
34	2330		3	23	483	0.7558	6	27	Chilime	Broad-leaved	21
63	2430		4	22	700	0.4471	6	36	Phulchoki	Evergreen Oak	16
106	2450		2	5			6	30	Kalingchok	*Rh. arboreum*	33
62	2480		3	20	200	0.6714	9	31	Phulchoki	*Quercus semecarpifolia*	29
107	2540	41	7	8			8	20	Kalingchok	*Rh. arboreum*	34
61	2540		2	20	267	0.6796	12	25	Phulchoki	*Quercus semecarpifolia*	28
98	2560	50	5	9			8	20	Kalingchok	*Quercus lanuginosa*	
109	2650	27	5	13			8	10	"	*Rh. arboreum* var. *campbelliae*	48
110	2660	46	5	10			5	15	"	Broad-leaved	48
108	2660	19	10	10			5	30	Rol Khane	*Rh. arboreum* var. *cambelliae*	48
33	2720		1	24	950	0.7002	8	21	Chilime	*Quercus semecarpifolia*	25
32	2840		3	40	433	1.2285	10	27	"	*Tsuga*	44
44	3000		2	15	950	0.7839	10	28	Langtang	*Quercus semecarpifolia*	26
102	3000	35	1	5			4	30	Kalingchok	*Rh. arboreum* var. *campbelliae*	47
116	3000	41	2	8			6	8	"	"	50
101	3010	31	4	5			4	10	Kalingchok	*Rh. arboreum* var. *campbelliae*	47
100	3020	25	1	5			3	10	"	"	47
118	3050	66	3	25			9	33	"	*Abies*	43
53	3060	14	5	5	3200	0.7365	10	20	"	*Rh. campanulatum*	52
117	3060	54	4	18			7	32	"	*Abies*	43
54	3120		3	46	1000	0.9710			"	"	39
60	3170		2	23	867	1.1763	9	11	"	"	40
55	3180				700	0.6496	11	10	"	*Juniperus*	45
31	3200	4	4	23	1400	0.4140	3	20	Chilime	*Abies*	38
30	3210		5	22	2600	0.5676	4	18	"	"	38
56	3250		3	35	566	1.0436	13	13	Kalingchok	"	39
111	3250	33	4	38			6	10	"	"	41
112	3300	44	3	40			6	10	"	"	42
115	3320	22	2	15			9	5	"	*Juniperus*	46
114	3400	50	2	10			9	10	"	*Rh. arboreum* var. *campbelliae*	49
58	3400						19	30	"	*Rh. campanulatum*	53
59	3410		3	9	800	0.3962	11	23	"	*Betula*	55
29	3690		6	4			12	10	Chilime	*Rh. campanulatum*	51
37	3740		7	13	800	0.5079	10	37	Langtang	*Betula*	54
35	3750	18	4	10	950	0.3647	8	47	Langtang	*Betula*	54
36	"	10	6	15	1800	0.6882	6	40	"	"	54

Table 3. Floristic Composition of Plain *Shorea robusta* Forest (Plot No. 74 & 75).

Canopy Plot & Quadrat No. (20 x 20m)	74–171	75–172	M
1st Layer			
Height m	27 ~ 31	29 ~ 32	28 ~ 32
No. of Species	3	7	5
Coverage %	95	95	95
Adina cordifolia	2	+	1.0
Dillenia pentagyna		+	
Lagerstroemia parviflora		+	
Shorea robusta	8	8	8.0
Terminalia chebula		+	
T. tomentosa		2	1.0
4950	+		
4955		1	0.5
2nd Layer			
Height m	5~8	5~8	5~8
No. of Species	7	2	5
Coverage %	+	+	+
Brideria retusa	+		
Carreya arborea	+		
Holarrhena antidysenterica		+	
Dillenia pentagyna	+		
Lagerstroemia parviflora	+		
Ougeinia dalbergioides	+		
4952	+		
4954	+	+	
Shrub Layer			
Height m	1~2	0.5~1	0.8~1.5
No. of Species	22	28	25
Coverage %	90	90	90
Adina cordifolia	1	+	0.5
Albizia lebbeck	+		
Bauhinia vahlii		6	3.0
Carreya arborea		+	
Cassia fistula	1		0.5
Clerodendron infortunatum	+		
Brucea mollis		+	
Dalbergia sisso		+	
Grewia laevigata		+	
G. vestita	1		0.5
Holoptelea integrifolia	+	+	
Lagerstroemia parviflora	+	+	
Leea crispa	1	+	0.5
L. sambucina		+	
Mallotus philippinensis	1		0.5
Micromerum integerrimum	2		1.0
Ougeinia dalbergioides	+	+	
Phyllanthus emblica	1	+	0.5
Shorea robusta	+	+	
Sterculia villosa	2	2	2.0
Semecarpus anacardium		+	
Terminalia berrelica		+	
T. tomentosa	+	+	
Woodfordia fruticosa	+		
Ziziphus mauritiana	1	+	0.5

Herb Layer Quadrat No. (1m x 1m)	74–171– 1	 2	 3	75–172– 1	 2	 3	 M	 C
Height cm	15~50	10~40	5~40	0~40	10~30	5~20	8~37	
No. of Species	4	6	7	6	6	4	6	
Coverage %	40	40	40	80	75	40	53	
Bauhinia vahlii				+	+	1	0.2	III
Brucea mollis				+		+		II
Grewia laevigata	+							
Shorea robusta	1	+	+	2	2	+	0.8	V
Stephania hernandifolia			+					
Acanthaceae	+		+		+			III
4969					+			
Imperata cylindrica	4	4	4	7	5	4	4.7	V
Phoenix humilis		+	+					II
Smilax lanceifolia		3	+	+			0.5	III
Thysanolaena maxima		+	+					II
Lygodium japonicum		+		1	+		0.2	III

Z. rugosa	+	+	
4950	+	+	
4952	+		
4956		+	
4958		+	
4961		+	
4961B		+	
4969	+		
Asparagus racemosus		+	
Costus		+	
Imperata cylindrica		8	4.0
Smilax lanceifolia	+	+	

Table 4. Floristic Composition of Plain *Shorea robusta* Forest (Plot No. 80 & 81).

Canopy Plot & Quadrat No. (20m x 20m)	80–179	81–180	M
1st Layer			
Height m	27	27	27
No. of Species	6	4	5
Coverage %	80	95	88
Adina cordifolia	2		0.5
Caesalpinia sepiaria?	+		
Elaeocarpus serrata?	+		
Eugenia operculata	+		
Lagerstroemia parviflora	+	+	
Shorea robusta	7	10	8
Terminalia tomentosa		+	
0007		+	
2nd Layer			
Height m	1.5 ~ 3	5 ~ 10	7
No. of Species	5	2	4
Coverage %	+	15	7.5
Caesalpinia sepiaria?	+		
Elaeocarpus serrata?	+		
Holarrhena antidysenterica	+		
Lagerstroemia parviflora	+		
Shorea robusta	+	2	1.0
0008		+	
Shrub Layer			
Height m	0.4 ~ 0.7	0.5 ~ 1	0.9
No. of Species	6	13	10
Coverage %	60	80	70
Clerodendron infortunatum	6	6	6
Cassia fistula		+	
Dillenia pentagyna		+	
Briderla retusa		+	
Holoptelea integrifolia		+	
Holarrhena antidysenterica	+	+	
Lagerstroemia parviflora	+	+	
Mallotus philippinensis	+		
Micromelum pubescens		+	
Shorea robusta	+	+	
Sageretia 0010B	+	+	
4926		+	
0003		+	
0009		+	
0010		+	
Labiatae		+	

Herb Layer Quadrat No. (1m x 1m)	80–179– 1	 2	 3	81–180– 1	 2	 3	M	C
Height cm	10~ 20	5~ 30	5~ 20	5~ 20	5~ 20	5~ 15	6~ 21	
No. of Species	4	6	5	3	3	5	4	
Coverage %	+	15	+	+	+	10	4	
Ageratum conizoides					+			I
Bauhinia purpurea		+						I
Clerodendron indicum					+			I
C. infortunatum	+	1	+	+		+	0.2	IV
Grewia		+						I
Machilus 0004	+							I
Micromelum pubescens					+			I
Phlogacantha thyrsiflora			+					I
Rungia parviflora		+				+		II
Shorea robusta		1	+			+	0.2	III
0010B					+			I
Dioscorea		+						I
Phoenix humilis			+	+				II
Lygodium flexuosum			+	+		1	0.2	III

Table 5. Floristic Composition of Montane *Shorea* Forest (Plot No. 71, 72 & 73).

Canopy Plot & Quadrat No. (10m × 10m)	71- 167	71- 168	72- 169	73- 170	M	C
1st Layer						
Height m	20	20	22	8~15	19	
No. of Species	8	4	1	9	6	
Coverage %	85	80	85	80	83	
Bauhinia purpurea	2			1	0.8	II
B. vahlii				+		I
Buchanania latifolia	1	1		2	1.0	IV
Holoptelea integrifolia	+					I
Lagerstroemia parviflora	+			+		III
Nyctanthes arbor-tristis				+		I
Ougeinia dalbergioides	+					I
Semecarpus anacardium	1			1	0.5	III
Shorea robusta	8	7	9	5	7.3	V
Terminalia chebura	+	+				III
T. tomentosa		+		2	0.5	III
Wendlandia puberula				+		I
2nd Layer						
Height m	3~4	3~7	5~7	3~5		
No. of Species	6	3	7	4	5	
Coverage %	+	+	70	+	18	
Bauhinia purpurea	+			+		III
Buchanania latifolia	+					I
Eugenia jambolana			+			I
Casearia glomerata			+			I
Glochidion velutinum	+					I
Holoptelea integrifolia	+	+				III
Kydia lobata			3		0.8	I
Machilus			+			I
Semecarpus anacardium	+			+		III
Shorea robusta				+		I
Wendlandia puberula		+	2	+	0.5	IV
4941 Celastraceae			+			I
4928	+					I
4942B			+			I
4951		+				I
Shrub Layer						
Height m	0.5~1	0.5~2	0.5~1	0.5~1.5	1.6	
No. of Species	7	8	3	10	7	
Coverage %	40	60	30	40	43	
Ampelocissus divaricata		+	+			III
Bauhinia purpurea	+	+				III
B. vahlii				+		I
Blumea		+				I
Buchanania latifolia		+				I
Desmodium gangeticum				+		I
Duabanga grandiflora	+					I
Hibiscus	+					I
Indigofera atropurpurea	+	1			0.3	III
Leea sambucina		+		+		III
Nyctanthes arbor-tristis	+					I
Terminalia tomentosa				+		I
Trema orientalis				+		I
4946 Convolvulaceae				+		I
4931 Leguminosae	1	1	1	+	0.8	I
Arundinella nepalensis				+		I
Phoenix humilis	3	4	3	4	3.5	V
Pseudopogonatherum contortum				2	0.5	I

Herb Layer Quadrat No. (1m × 1m)	71-167- 1	 2	 3	71-168- 1	 2	 3	72-169- 1	 2	 3	73-170- 1	 2	 3	M	C
Height cm	10~25	5~20	10~30	5~20	5~25	5~20	10~25	5~25	0~20	10~30	5~20	10~30	7~24	
No. of Species	7	7	6	4	5	5	3	5	6	6	7	4	5	
Coverage %	30	40	50	20	25	+	40	30	20	75	70	70	39	
Bauhinia purpurea	+		+											I
Blumea					+									
Blumea 4936		+												
Desmodium velutinum				1									0.1	
Echinacanthus attenuatus							+							
Inula 4948												+		
Leea sambucina									+					
Melothria heterophylla									+					
Nyctanthes arbor-tristis	+	+	+		+	+								II
Securinega									+					
Shorea robusta	+	+	+							+	+			II
Stephania hernandifolia						+								
Strobilanthes 4947										+	+			I
Terminalia tomentosa						+								
Wendlandia exserta											+			
4935 Acanthaceae?		+												
Compositae										+				
4931 Leguminosae	1	+											0.1	I
4934 Sapindaceae	+	+	+											
4939B				+										
4940					+									
Arundinaria 4943							1	2	1				0.3	I
Arundinella nepalensis								+			+			I
Capillipedium assimile									+					
Carex cruciata	3	4	5	2	3	+				5	2	7	2.6	IV
C. levis							+	+	+			+		II
Phoenix humilis			+					+	+	+	+	+		III
Pseudopogonatherum contortum										2	6		0.7	I
Smilax lanceifolia								+						
Trachycarpus?	+	+	+		+									II
Adianthum				+										

Table 6. Floristic Composition of Montane *Shorea* Forest (Plot No. 78).

Canopy Plot & Quadrat No. (10m x 10m)	78–176	78–177	M
1st Layer			
Height m	19	19	19
No. of Species	1	1	1
Coverage %	90	70	80
Shorea robusta	9	7	8
2nd Layer			
Height m	3~7	2~7	
No. of Species	7	8	8
Coverage %	40	30	35
Callicarpa macrophylla	+		
Ehretia 4991		+	
Emblica officinalis		+	
Glochidion velutinum	1	+	0.5
Grewia vestita	+		
Pueraria phaseoloides	+		
Semecarpus anacardium	+	+	
Shorea robusta	+		
Terminalia tomentosa	3	2	2.5
Convolulaceae *4987*		+	
4990	+	+	
Shrub Layer			
Height m	1~2	0.5~1.5	
No. of Species	12	12	12
Coverage %	20	20	20
Acacia	+	+	
Blumea		1	0.5
Desmodium gengeticum	+	+	
Ehretia laevis	+		
Ehretia 4991		+	
Emblica officinalis	+	+	
Eugenia operculata	+		
Glochidion velutinum		+	
Hibiscus?	+	+	
Inula cappa	1		0.5
Lagerstroemia parviflora	+		
Leea umbraculifera	+	+	
Terminalia tomentosa		+	
Urena lobata		+	
Woodfordia fruticosa	+		
Phoenix humilis	2	1	1.5
Smilax ovatifolia	+	+	

Herb Layer Quadrat No. (1m x 1m)	78–176 1	2	3	78–177 1	2	3	M	C
Height cm	0~20	0~30	0~30	0~20	0~15	0~15	0~22	
No. of Species	4	4	5	4	4	7	5	
Coverage %	50	60	60	25	50	50	49	
Blumeopsis falcata				+				I
Callicarpa macrophylla		1					0.2	I
Clerodendron indicum						1	0.2	I
Desmodium gangeticum					+			I
Indigofera 4999						1	0.2	I
Phlogacathus thyrsiflorus	+	1	+	+	+	+	0.2	V
Reinwardtia indica						+		I
Rungia parviflora				+				I
Semecarpus anacardium			+					I
Shorea robusta				+				I
Swertia pulchella	+	+						II
Urena lobata						1	0.2	I
Xylosma longifolia					+			I
4985	+		+					II
Carex cruciata	5	5	6	3	5	4	4.7	V
Smilax lanceifolia			+					I
Lygodium japonicum						+		I

Table 7. Floristic Composition of *Terminalia* Forest (Plot No. 76).

Canopy Plot & Quadrat No. (20m x 20m)	76–173
Height m	33
No. of Species	3
Coverage %	60
Carreya arborea	1
Shorea robusta	+
Terminalia tomentosa	5
2nd Layer	
Height m	6~9
No. of Species	10
Coverage %	60
Bauhinia purpurea	+
Bridelia retusa	+
Carreya arborea	2
Grewia	+
Holoptelea integrifolia	1
Lagerstroemia parviflora	2
Mallotus philippinensis	+
Terminalia chebula	+
Ziziphus rugosa	+
4963	+
Shrub Layer	
Height m	0.5~1
No. of Species	11
Coverage %	30
Bridelia retusa	+
Carreya arborea	+
Croton oblongifolia	1
Hibiscus	+
Holarrhena antidysenterica	+
Holoptelea integrifolia	+
Leea crispa	1
Mallotus philippinensis	1
Shorea robusta	+
Smilax lanceifolia	+
Lygodium japonicum	1

Herb Layer Quadrat No. (1m x 1m)	76–173– 1	2	3	M
Height cm	10~50	10~30	10~40	10~40
No. of Species	6	4	5	5
Coverage %	40	30	30	33
Clerodendron infortunatum		+	+	
Piper	1		1	0.7
Shorea robusta	+	+		
Acanthaceae	1	+		
Carex laevis			3	1.0
Imperata cylindrica	4		+	1.3
Oryza officinalis		3	+	1.0
Lygodium japonicum	+			
Fern	+			

Table 8. Floristic Composition of *Acacia* Forest (Plot No. 79).

Canopy Plot & Quadrat No. (10m x10m)	79–178
1st Layer	
Height m	21
No. of Species	2
Coverage %	60
Acacia eburnea	6
Trachelospermum lucidum	+
2nd Layer	
Height m	2.5~ 5
No. of Species	8
Coverage %	5
Adina cordifolia	+
Caesalpinia 5000	+
Clerodendron 4998B	+
Colebrookia oppositifolia	1
Erythrina 0001	+
Toddaria asiatica	+
Trachelospermum lucidum	+
4998	+
3rd Layer	
Height m	0.5~ 1
No. of Species	4
Coverage %	70
Colebrookia oppositifolia	+
Eupatorium adenophorum	+
Toddaria asiatica	+
Elshortzia	7

Herb Layer Quadrat No. (1m x 1m)	79–178– 1	2	3	M	C
Height cm	0~ 20	0~ 25	0~ 20	0~ 22	
No. of Species	2	5	5	4	
Coverage %	90	80	60	77	
Ageratum conizoides	9	2	6	5.7	V
Eupatorium adenophorum		+			II
Boelhavia diffusa		+	+		III
Peperomia cordata		+	1	0.3	III
Rungia parviflora	1	6	+	3.3	V
5000B Labiatae			+		II

Table 9. Floristic Composition of *Schima* Forest (Plot No. 1, 2 & 3).

Canopy Plot & Quadrat No. (10m x 10m)	1– 7	1– 8	2– 9	3– 10	M	C
1st Layer						
Height m	15~ 10	17	25	20	19	
Number of Species	3	3	2	2	3	
Coverage %	80	70	70	50	67	
Castanopsis indica	2				0.5	I
C. tribuloides		4			1.0	I
Eurya acuminata		1			0.3	I
Juglans regia			7		1.8	I
Meliosma simplicifolia				1	0.3	I
Myrica esculenta	+					I
Schima wallichii	6	3	1	3	3.3	I
2nd Layer						
Height m	4	5~4	8	8~5	6~5	
Number of Species	2	5	2	3	3	
Coverage %	10	5	5	70	22	
Castanopsis indica		1			0.3	I
C. tribuloides	+	+	1		0.3	IV
Cinnamomum tamala				2	0.5	I
Lyonia ovalifolia	+					I
Myrica esculenta		1			0.3	I
Myrsine semiserrata		+		5	1.3	III
Quercus spicata				+		I
Schima wallichii			+			I
Wendlandia puberula		2			0.5	I
Shrub Layer						
Height m	1.5~ 1	1.5~ 1	1	2~ 1	1.5~ 1	
Number of Species	19	10	8	6	11	
Coverage %	40	50	5	30	31	
Berberis asiatica	+	+				III
Castanopsis indica	+	1	+	+	0.3	V
C. tribuloides	+					I
Cinnamomum tamala				+		I
Craniotome versicolor			+			I
Eurya acuminata	+	+				III
Glochidion velutinum	+	+				III
Ligustrum nepalense	+	+	+			IV
Lyonia ovalifolia	+					I
Machilus duthiei				+		I
Melastoma malabarica	+					I
Myrica esculenta	+					I
Myrsine africana	+					I
M. semiserrata	4	5	+		2.3	IV
Hypericum uralum	+					I
Osmanthus fragrans				+		I
Phyllanthus parvifolius	+	+				III
Pogostemon amaranthoides			1		0.3	I
Pyrus pashia	+					I
Quercus spicata	+			+		III
Rubus ellipticus	+					I
R. scandens			+			I
Sarcococca coriacea	+	1	+	1	0.5	V
Schima wallichii	+	+				III
Strobilanthes pentastemonoides			+			I
Wendlandia puberula	+	+				III

Herb Layer Quadrat No. (1m x 1m)	1–7– 1	2	3	1–8– 1	2	3	2–9– 1	2	3	3–10– 1	2	3	M	C
Height cm	50~ 20	30~ 20	30~ 15	25~ 5	25~ 5	30~ 5	30~ 10	20~ 10	20~ 10	30~ 5	25~ 5	30~ 5	29~ 9	
Number of Species	9	9	7	9	4	9	9	11	13	11	7	13	9	
Coverage %	40	30	60	15	15	40	60	75	75	60	50	40	46	
Achylanthes bidentata							+							
Berberis asiatica		+	+	+					+					II
Blumea aromatica										+				
B. hieracifolia				+										
Ceropegia pubescens										+	+			I
Castanopsis tribuloides	1	+												I
Craniotome versicolor							+							
Desmodium oxyphyllum		+										+		I
Ficus foveolata										+		+		I
F. neriifolia												+		
Hedera nepalensis											1	1	0.2	I
Melissa flava							+	2	2				0.3	I
Myrsine semiserrata	+	+	+	+	+	+	+	+	+		+	+		V
Hypericum uralum			+											
Osmanthus fragrans										+				
Phoebe lanceolata	+											+		I
Phyllanthus parvifolius				+										
Piper peepuloides												1	0.1	
Pogostemon amaranthoides	+										+			I
Polygonum microcephalum									+					
Pyrus pashia									+					
Rhus javanica				+										
Rubia cordifolia									+					
Rubus scandens						+								
Rumex hastata					+									
Sarcococca coriacea							+	+	+					I
Shuteria vestita						+								
Strobilanthes atropurpureus		+		+						+				I
S. pentastemonoides							3	4	2			1	0.8	II
Tetrasperma serrulata												+		
Viola serpens	+													
Youngia japonica								+						
Ziziphus incurva		+												
Capillipedium assimile	+				+	+		+	+					II
Carex cruciata	+		+	+	1	1		1		+			0.3	III
C. longipes							+	1	1	1		1	0.3	II
Chrysopogon aciculatus	+		+											I
Ophiopogon intermedia											+			
Oplismenus compositus							+	+	+	+		+		II
Pogonatherum paniceum	4	2	5	2									1.1	II
Athyrium drepanopterum		+												
Cheilanthes albomarginata		+	+			+								I
Dryopteris sparsa				+		+								I
Microlepia speluncea							1	1	+	+	1	2	0.4	III
Polystichum aculeatum						+		+	1				0.1	I
P. lentum										3	3		0.5	I
Selaginella monospora						+								
Pteris pellucida												+		

Table 10. Floristic Composition of *Schima* Forest (Plot No. 4).

Canopy Plot & Quadrat No. (10m x 10m)	4-11	4-12	4-13	4-14	4-15	4-16	M	C
1st Layer Height m	30~20	25~20	25~20	25~20	25~20	25~20	26~20	
Number of Species	6	5	4	5	4	4	5	
Coverage %	90	90	95	85	85	80	87	
Acer oblongum					3		0.5	I
Cornus oblonga	1			3			0.7	II
Ligustrum nepalense	1			1	+		0.3	III
Lyonia ovalifolia		+						I
Machilus duthiei		1	2	1		5	1.5	III
Myrica esculenta					1		0.2	I
Myrsine semiserrata						2	0.3	I
Phoebe lanceolata	1	1	4	1			1.2	III
Pyrus pashia	1	1	1			1	0.7	III
Quercus spicata	5	7					2.0	II
Schima wallichii	1		3	4	4	2	2.3	IV
2nd Layer Height m	4~2	5	5~3	6~5	5~3	8~5	6~4	
Number of Species	1	2	3	2	3	3	2	
Coverage %	5	+	15	+	15	20	9	
Acer oblongum					+			I
Eurya acuminata					+			I
Ligustrum nepalense						1	0.2	I
Lyonia ovalifolia		+	+					II
Myrine semiserrata		+	2	+	2	1	0.8	IV
Phoebe lanceolata	+			2			0.3	II
Pyrus pashia			1			1	0.3	II
Shrub Layer Height m	1~0.5	0.5	1~0.5	1	1~0.5	1~0.5	0.9~0.5	
Number of Species	12	9	15	17	13	12	13	
Coverage %	5	+	+	5	20	20	5	
Ardisia macrocarpa	+		+					II
Boehmeria sidaefolia			+					I
Caryopteris grata			+	+				II
Castanopsis tribuloides	+		+	+	+			III
Cinnamomum tamala	+	+			+			III
Daphne bholua						+		I
Desmodium oxyphyllum	+		+	+	+	+		IV
Eriobotrya hookeriana	+		+	+	+	+		IV
Ligustrum nepalense	+				+	+		III
Machilus duthiei	+	+	+	+	+	+		V
Mahonia nepalensis				+				I
Mysine semiserrata		+	+		+	+		III
Hypericum uralum	+			+				II
Oxyspora paniculata				+				I
Phoebe lanceolata	1	+	+	1	+	+	0.3	V
Pilea scripta	+							I
Pogostemon amaranthoides		+						I
Prunus cerasoides			+	+				II
Pyrus pashia		+						I
Quercus spicata		+		+				II
Randia tetrasperma					+			I
Rhynchospermum verticillatum	+							I
Rubus foliosus						+		I
Sarcococca coriacea	+	+	+	+	+	+		V
Strobilanthes pentastemonoides			+			+		II
Xylosma controversa					+			I
Arundinaria falcata			+	+	+	+		III
Smilax asper..		+	+	+				III
Dryopteris sparsa				+				I
Polystichum aculeatum			+	+	+	+		III

Herb Layer Quadrat No. (1m x 1m)	4-11-				4-12-			4-13-			4-14-				
	1	2	3	4	1	2	3	1	2	3	1	2	3	M	C
Herb Layer Height cm	30~15	30~15	30~10	20~10	15~10	15~10	30~20	25~5	30~5	20~5	20~10	20~10	20~10	23~10	
Number of Species	6	9	6	13	4	5	8	7	5	6	8	12	8	7	
Coverage %	5	20	40	30	10	20	15	15	10	10	20	20	20	18	
Ardisia macrocarpa													+		
Berberis asiatica				+											
Boenninghausenia albiflora				+				+				+			I
Ceropegia pubescens	+	+						-							I
Cinnamomum tamala					+										
Codariocalyx motorius							+								
Desmodium oxyphyllum	+	+				+		+		+	+	+	+		III
Eriobotrya hookeriana									+				+		I
Ficus foveolata											+				
Gentiana capitata	+	+	+	+											II
Indigofera							+								
Ligustrum nepalense					+										
Myrsine semicerrata		+		+				+							I
Hypericum uralum				+			+								I
Phoebe lanceolata	+	1	1	1	+	+	+	+	+	+		+	+	0.2	V
Rhynchospermum verticillatum											+				
Sarcococca coriacea						+						+			I
Shuteria vestita													+		
Strobilanthes atropurpureus										+					
S. pentastemonoides	+								+		+				I
Tetrasperma serrulata		1	+					+						0.1	I
Viola		+		+			+					+			II
Youngia japonica												+			
Capillipedium assimile				+							1	+	1	0.2	II
Carex longipes			+							+	+	+			II
Ophiopogon intermedia						+									
Oplismenus compositus	+	+	1	+	+	1	+	+	+	+				0.2	IV
Smilax aspera												+			
Athyrium macrocarpum										1				0.1	
Dryopteris sparsa		1		1			+				+	+		0.2	II
Onchyium lucidum				+											
Polystichum aculeatum							+		1				+	0.1	I
Pteris quadriaurita								+							
Selaginella monospora				+								+	+		I
Thelypteris esquirolii			1	1										0.2	I
Moss											+				

Table 11. Floristic Composition of *Schima* Forest (Plot No. 77).

Canopy Plot & Quadrat No. (10m x 10m)	77–174	77–175	M
1st Layer			
Height m	20		
No. of Species	2	1	2
Coverage %	50	60	55
Castanopsis tribuloides	4		2
Schima wallichii	3	6	5
2nd Layer			
Height m	3~6	3~6	
No. of Species	3	2	3
Coverage %	20	30	25
Castanopsis tribuloides	1	1	2
Eugenia operculata	+		
Machilus odoratissima	1	2	1.5
Shrub Layer			
Height m	0.5~ 1.5	0.5 ~ 1	
No. of Species	17	10	19
Coverage %	30	10	20
Castanopsis tribuloides	1	1	2
Desmodium gangeticum	+		
Ehretia	+	+	
Elshorzia blanda	+		
Emblica officinalis	+		
Eugenia operculata		+	
Eurya acuminata		+	
Glochidion velutinum	+	+	
Leea umbraculifera	+		
Lyonia ovalifolia	+		
Machilus odoratissima	+	+	
Osbeckia stellata	+		
Quercus spicata	+	+	
Rhus javanica	+	+	
Sageretia	+		
Schima wallichii		+	
Shorea robusta	1		0.5
Walsula trijuga	+	+	
Costus speciosus	+	1	
Phoenix humilis	+		

Herb Layer Plot & Quadrat No. (1m x 1m)	77–174– 1	2	3	77–175– 1	2	3	M	C
Height cm	0~ 40	5~ 20	0~ 40	0~ 40	0~ 25	0~ 30	0~ 33	
No. of Species	10	8	9	14	11	10	10	
Coverage %	50	50	70	80	60	40	58	
Adenostemma laevis				+				I
Castanopsis tribuloides					+			I
Craniotome versicolor	+		+	+	1	+	0.2	V
Desmodium gangeticum			+					I
Ehretia				+				I
Elshozia blanda	+	1		+	+		0.2	III
Emblica officinalis						+		I
Gentiana				+				I
Grewia oppositifolia		2					0.3	I
Leea umbraculifera		+				+		II
Osbeckia stellata			3	+	+	+	0.5	III
Sageretia			+	+	+	+		III
Stachys 4978			1				0.2	I
Strobilanthes 4979	+	1		+			0.2	III
Capillipedium compositum					+			I
Carex	3	3	2	5	2	3	3.0	V
Costus speciosus				+				I
Dioscorea deltoides	+	+				+		III
Goodyera	+							I
Phoenix humilis			+					I
Cheilanthes albo-marginata	+							I
Dryopteris cochleata	1	1	1	1	1	+	0.8	V
Selaginella	+			+	+	+		III
Thelypteris dentata				1			0.2	I
Moss *4978*	3	1	2	2	4	2	2.3	V

Table 12. Floristic Composition of *Pinus* Forest (Plot No. 9 & 10)

Canopy Plot & Quadrat No. (10m x 10m)	9– 28	9– 29	10– 30	M	C
1st Layer					
Height m	20	23	22	22	
Number of Species	1	1	1	1	
Coverage %	85	70	60	71	
Pinus roxburghii	9	7	6	7.3	V
2nd Layer					
Height m	10 ~ 8	10 ~ 8	5	8	
Number of Species	2	1	1	1	
Coverage %	30	30	+	20	
Myrica esculenta	1			0.3	II
Pinus roxburghii			+		II
Schima wallichii	2	3		1.7	III
3rd Layer					
Height m	3–2	2		3	
Number of Species	4	1		2	
Coverage %	+	+		0	
Myrica esculenta	+				II
Myrsine semiserrata	1			0.3	II
Sarcococca coriacea	1			0.3	II
Schima wallichii	+	+			III
Shrub Layer					
Height m	1	1~ 0.5	1.5~ 0.5	1.2	
Number of Species	8	11	8	9	
Coverage %	5	20	20	15	
Berberis asiatica	+	+	2	0.7	V
Betula alnoides		+			II
Castanopsis indica	+				II
C. tribuloides		+			II
Clematis vitifolia			+		II
Cinnamomum glanduliferum	+				II
Colebrookia oppositifolia	+		1	0.3	III
Fraxinus floribunda		+			II
Glochidion velutinum		+	+		III
Melastoma malabarica	+				II
Myrsine semiserrata	1	2	+	1.0	V
Phyllanthus parvifolius			+		II
Pinus roxburghii		+			II
Rubus ellipticus		+	+		III
Sarcococca coriacea	1	1		0.7	III
Schima wallichii	+	+			III
Wendlandia coriacea		+			II
Woodfordia fruticosa			+		II

Herb Layer Quadrat No. (1m x 1m)	9–28– 1	2	3	9–29– 1	2	3	10–30– 1	2	3	M	C
Height cm	30~ 10	20~ 10	15~ 10	20~ 10	15~ 10	15	25~ 10	25~ 10	25~ 10	21~ 10	
Number of Species	5	5	2	4	3	6	10	5	8	6	
Coverage %	40	40	60	50	20	10	40	40	30	36	
Colebrookia oppositifolia							+		+		I
Coniza japonica		+							+		I
Croton caudatus						+	+				I
Glochidion velutinum						+					I
Justicia procumbens							+	+	+		II
Lepidagathis hyalina							+				I
Melastoma malabarica	+										I
Moghania strobilifera							+				I
Myrsine semiserrata				+		+					I
Phyllathus parvifolius	+					+	+	+	+		III
Rubus ellipticus					+						I
Arundinella nepalensis	+	+				+	+	+	1		III
Imperata cylindrica	2	2	1	1	+		1	+	+	0.8	IV
Oplismenus compositus				+		+					I
Pogonatherum paniceum	3	2	4	5	2		3	4	3	2.9	IV
Cheilanthes albomarginata		+					+		+		II

Table 13. Floristic Composition of *Pinus* Forest (Plot No. 48)

Canopy Plot & Quadrat No. (10m x 10m)	48–108
1st Layer	
Height m	35
No. of Species	1
Coverage %	40
Pinus griffithii	4
Shrub Layer	
Height m	0.4
No. of Species	6
Coverage %	+
Daphne bholua	+
Ligustrum confusum	+
Phyllanthus parvifolius	+
Schima wallichii	+
Arisaema tortuosum	+
Pinus griffithii	+

Herb Layer Quadrat No. (1m x 1m)	48–108– 1	2	3	M	C
Height cm	5	5	5	5	
No. of Species	15	18	15	16	
Coverage %	100	100	97	99	
Ageratum conizoides	+	+	+		V
Centella asiatica	1		1	0.7	III
Clinopodium umbrosum	+	+	+		V
Erigeron 2741		+	+		III
Gonostegia hirta	+	+	+		V
Justicia simplex	+	+	+		V
Micromeria biflora			+		II
Moghania strobilifera	+	+	+		V
Oxalis corniculatus	+	+	+		V
Phyllanthus parvifolius	+	1		0.3	III
Scutellaria discolor		+	+		III
Smithia geminiflora	+	+	+		V
Viola serpens	+	+	+		V
Cyanotis cristata	+	+			III
Fimbristylis diphylla	1	2		1.0	III
Isachne miliacea	2	1	1	1.3	V
Sporobolus fertilis	8	8	9	8.3	V
Lepisorus 2742		1		0.3	II
Lygodium japonicum		+			II
Selaginella involvens	6	4	4	4.7	V

Table 14. Floristic Composition of Evergreen Oak Forest (Plot No. 47).

Canopy Plot & Quadrat No. (10m x 10m)	47–107
1st Layer	
Height m	18
No. of Species	2
Coverage %	75
Quercus glauca	6
Quercus spicata	2
2nd Layer	
Height m	10
No. of Species	5
Coverage %	40
Brassaiopsis	1
Machilus duthiei	2
Mallotus nepalensis	+
Polygala arillata	+
Quercus spicata	1
Shrub Layer	
Height m	2~1
No. of Species	9
Coverage %	80
Brassaiopsis	+
Ficus nemoralis	+
Glochidion velutinum	+
Maesa chisia	+
Pilea symmerica	7
Polygonum chinense	+
Rubia acuminata	+
Strobilanthes atropurpureus	+
Arundinaria hookeriana	1

Herb Layer Quadrat No. (1m x 1m)	47–107– 1	2	3	M	C
Height cm	40~ 10	30~ 5	30~ 5	33~ 7	
No. of Species	10	7	6	8	
Coverage %	80	90	50	73	
Boehmeria polystachya		+			II
Elatostema obtusa		9		3	II
Myrsine semiserrata	+				II
Rhynchospermum verticillatum	+		2	0.7	III
Rubus acuminatus	1			0.3	II
Strobilanthes atropurpureus	1		+	0.3	III
Carex filicina			+		II
Carex finitima	+				II
Globba racemosa	3	+	3	2	V
Oplismenus compositus	2	2	5	3	V
Gramineae *2719*	+				II
Coniogramme caudata	1			0.3	II
Dryopteris odontoloma	1	1		0.7	III
Dryopteris		1		0.3	II
Pteris venusta		+	+		III

Table 15. Floristic Composition of Evergreen Oak Forest (Plot No. 51 & 52).

Canopy Plot & Quadrat No. (10m x 10m)	51–112	52–113	M
1st Layer			
Height m	18	15	17
No. of Species	1	2	2
Coverage %	90	90	90
Quercus lineata	9	9	9.0
Rhododendron arboreum		1	0.5
2nd Layer			
Height m	10	10	10
No. of Species	1	2	2
Coverage %	30	+	15
Rhododendron arboreum	3	+	1.5
Vitis parvifolia		+	
Shrub Layer			
Height m	2~1	2~1	2~1
No. of Species	10	7	9
Coverage %	30	+	15
Berberis aristata	+		
Castanopsis tribuloides	+		
Cochlianthus gracilis		+	
Daphne bholua	+		
Desmodium tiliaefolium		+	
Elaeagnus conferta	1		0.5
Indigofera pulchella		+	
Lindera pulcherrima		+	
Lyonia ovalifolia	+		
Machilus	+		
Quercus lineata	+		
Rubus acuminatus		+	
Symplocos crataegoides	+		
Viburnum erubescens		+	
Arundinaria hookeriana	3	+	1.5
Smilax menispermoidea	+		

Herb Layer Quadrat No. (1m x 1m)	51–112– 1	2	3	52–113– 1	2	3	M	C
Height cm	30	20	30	40	60~ 15	20	33	
No. of Species	6	7	8	13	11	10	9	
Coverage %	20	80	40	70	80	60	58	
Ainsliaea pteropoda	1	1	1	2	6	5	2.7	V
Aristolochia griffithii			+		+	+		III
Cochlianthus gracilis	1	+		+	+		0.2	III
Daphne bholua			+	+				II
Hedera nepalensis			+	+				II
Lindera bifaria					+	+		II
Lyonia ovalifolia						+		I
Myriactis nepalensis						+		I
Myrsine semiserrata					+			I
Ophiorhiza				1	1		0.3	II
Prunus cerasoides	+							I
Sanicula elata				+				I
Shuteria vestita			+					I
Strobilanthes atropurpureus				1			0.2	I
Tetrastigma serrulata					+	+		II
Viola serpens				+				I
Arisaema erubescens		+						I
Chrysopogon aciculatus			1				0.2	I
Disporum cantoniense				+				I
Chlorophytum nepalense		+						I
Hedycium ellipticum	1	7		3	3		2.3	III
Ophiopogon clarkei	+	1	1	1		+	1.0	IV
Roscoea purpurea	1		+				0.2	II
Smilax menispermoidea						+		I
Athyrium drepanopterum				1			0.2	I
Botrychium lanuginosum		+						I
Onychium japonicum					+			I
Pteris cretica				1			0.2	I
Leptodontium						+		I
Moss					+	+		II

Table 16. Floristic Composition of Evergreen Oak Forest (Plot No. 63).

Canopy Plot & Quadrat No. (10m x 10m)	63– 146	147	148	149	150	151	M	C
1st Layer								
Height m	20	20	20	20	20	30	22	
Number of Species	2	2	2	2	3	3	2	
Coverage %	75	70	60	30	50	30	53	
Euonymus tingens					1		0.1	I
Machilus duthiei						1	0.1	I
M. sericea			1				0.1	I
Quercus lamellosa	4	4	5	2	1		2.7	IV
Q. lineata	4	4		1	4	1	2.3	IV
Q. semecarpifolia						1	0.1	I
2nd Layer								
Height m	10	10	8~10	8~10	8~10	5~8	8~9	
Number of Species	4	2	2	3	2	2	3	
Coverage %	70	40	50	40	15	10	38	
Rhododendron arboreum		3			1		0.7	II
Euonymus pendulus	2						0.3	I
E. tingens	1						0.1	I
Eurya acuminata				2			0.3	I
Ilex dipyrena					1		0.1	I
Lindera pulcherrima				1			0.1	I
Machilus duthiei				1		1	0.3	II
M. sericea			2				0.3	I
Quercus lamellosa	4	1	2				1.2	III
Q. lineata	2						0.3	I
Q. semecarpifolia						1	0.2	I
Shrub Layer								
Height m	1~3	3~8	2~5	2~5	2~3	2	2~4	
Number of Species	3	7	3	4	2	3	4	
Coverage %	10	30	30	20	15	25	22	
Berberis chitria		1					0.1	I
Daphne bholua		1		1			0.3	II
Eurya acuminata			1				0.1	I
Lindera pulcherrima		1	1			1	0.5	III
Machilus duthiei		1	2	1	1		0.8	III
Meliosma dilleniaefolia				+				I
Quercus lineata	1	+					0.1	II
Trichilia connaroides						1	0.1	I
4845	+							I
Arundinaria maling	+	+		1		1	0.3	III
4854		1					0.1	I
4859					1		0.1	I

Herb Layer Plot & Quadrat No. (1m x 1m)	63–146– 1	2	3	63–147– 1	2	3	63–148– 1	2	3	63–149– 1	2	3	63–150 1	2	3	63–151– 1	2	3	M	C
Height cm	0~30	10~30	20~30	10~20	10~20	0~30	10~40	10~50	5~40	0~50	5~30	0~40	10~30	10~40	20~50	5~30	10~40	0~40	8~36	
Number of Species	8	3	4	4	5	8	3	5	6	8	7	9	5	4	4	7	8	10	6	
Coverage %	45	80	30	20	50	50	70	40	20	70	75	65	40	20	30	30	40	50	46	
Ainsliaea pteropoda						1						+				2			0.2	I
Anisomeles indica								+		+										I
Hymenopogon parasiticus										+										I
Ligustrum indicum						+												+		I
Rubia manjith	+									1									0.1	I
Senecio scandens									+											
Strobilanthes atropurpureus		8		1	4	2	6		1		4	1	1	+		+	3	+	1.7	IV
Begonia adscendens										+										
Daphne bholua									+		+	1	+	+					0.1	I
Hedera nepalensis												+								
Lindera pulcherrima					+						+		+							I
Parthenocissus semicordata												+								
Polygonum sphaerocephalum										1							+		0.1	I
Pilea symmerica																+		+		I
Quercus lamellosa													+							
Q. lineata						+										+				I
Q. semecarpifolia	+		+																	I
Rubus					+											+	+	+		I
Sanicula elata											+									
Arundinaria maling									+	1	+					+	+	+	0.1	II
Calanthe mannii				1															0.1	
Carex myosurus	1			+				1	1				3	1			1	3	0.6	II
Hedychium spicatum	+	+	2											1					0.2	I
Oplismenus undulatifolius															1				0.1	
Smilax menispermoidea		+	+			+		1		+		1			+				0.1	II
Dryopteris odontoloma	1		1	+	+	1	1	1	+		1	1			2		1	+	0.6	IV
Pteris cretica												+			1					I
Mosses and lichens	3					1		1		4	2	3				1		1	0.9	II
4850	+																			
4848	+																			
4852					+												+	+		I
4858						+														
4861							+													
4872																	+			
4873																		1		

Table 17. Floristic Composition of Evergreen Oak Forest (Plot No. 64)

Canopy Plot No. Quadrat No. (10m x 10m)	64– 152	153	154	155	156	157	M	C
1st Layer								
Height m	27~20						27~20	
Number of Species	2	2	3	1	3	1	2	
Coverage %	60	50	30	50	90	50	55	
Carpinus viminea			1		8		1.5	II
Eurya cerasifolia					+			I
Quercus glauca	2	3	2				1.2	III
Q. lineata	4	2	1	5	2	5	3.2	V

Herb Layer Quadrat No. (1m x 1m)	64–152– 1	2	3	64–153– 1	2	3	64–154– 1	2	3	64–155– 1	2	3	64–156– 1	2	3	64–157– 1	2	3	M	C
Height cm	5~30	5~40	5~20	5~30	5~50	10~20	5~50	0~50	0~30	5~30	10~40	0~30	5~20	5~30	5~30	0~30	0~30	0~20	4~32	
Number of Species	10	15	10	11	15	8	10	13	11	10	12	15	12	15	11	11	16	18	12	
Coverage %	80	50	40	60	70	30	90	80	90	90	80	70	90	70	80	40	80	95	71	
Craniotome furcata									+	+							+			I
Gaultheria fragrantissima										+										
Jasminum officinale					+															
Inula cappa							+													
Lyonia ovalifolia		+					+	1				+							0.1	I

2nd Layer								
Height m	5~7	5~7		4	3	8	5~6	
Number of Species	6	3	0	4	4	3	3	
Coverage %	50	40		+	+	30	23	
Rhododendron arboreum	2						0.3	I
Symplocos ramosissima	1			+			0.2	II
Brassaiopsis glomerata					+			I
Carpinus viminea	+	2					0.2	II
Eurya acuminata	2	1		+		3	1.0	III
Lindera pulcherrima	1	2		+	+		0.5	III
Machilus duthiei					+			I
Mallotus nepalensis						+		I
Quercus glauca					+			I
Q. lineata	2					+	0.3	II
Rhus succedanea				+				I
Shrub Layer								
Height m	1~ 1.5	1~ 2	1~ 3	1~ 2	1~ 2	1~ 2	1~ 2	
Number of Species	15	9	6	13	12	13	11	
Coverage %	30	40	80	70	70	60	58	
Gaultheria fragrantissima				+				I
Ligustrum indicum	1						0.2	I
Lyonia ovalifolia						+		I
Myrsine semiserrata				+	+	2	0.3	III
Rhododendron arboreum				1			0.2	I
Strobilanthes atropurpureus	+							I
Symplocos ramosissima			3	1			0.7	II
Viburnum erubescens	+			+				II
V. mullaha					+			I
Acer oblongum	+							I
Betula utilis	+							I
Carpinus viminea				+				I
Celtis tetrandra	+							I
Cleyera japonica var. *wallichiana*						+		I
Dobinea vulgaris	+				+			II
Eriobotrya hookeriana					+	+		II
Euonymus			1				0.2	I
Eurya acuminata	1	1	1			+	0.5	III
E. cerasifolia		+			1		0.2	II
Lindera nacusa				+				I
L. pulcherrima		2	4	1	2	2	1.8	IV
Litsea oblonga						+		I
Machilus duthiei		+	1		2		0.5	III
Mallotus nepalensis					+			I
Meliosma pungens	+			+	+	+		III
Michelia kisopa	+							I
Myrica esculenta						+		I
Pilea smilacifolia						+		I
Quercus glauca		+		+				II
Q. lamellosa	+							I
Q. lineata	+					3	0.5	II
Rubus diffusus	1			+		+		III
R. rugosus	+		1	+	+	+	0.2	IV
Saurauja napaulensis		+						I
Skimmia melanocarpa	+	1					0.2	II
Sorbus hedlundi		2		3			0.8	I
Cautleya spicata		+			+			II
Woodwardia unigemmata					+			I

Lysimachia debilis		+					+													I
Melissa flava												+	+	+	1				0.1	I
Myrsine semiserrata																	+			
Myriactis nepalensis						+				+	+						+			I
Ophiorrhiza prostrata	+	+	+	+	+								+	+	+		+			II
Rhododendron arboreum												+						+		
Rhyncospermum verticillatum				+		+	1					+						+	0.1	I
Rubia wallichiana					+															
Senecio triligulatus											+				2	+	1	+	0.2	I
Strobilanthes atropurpureus	1	1	+	3	+		2	1	2	4	2		1	1			+	+	1.0	IV
Symplocos ramosissima				1								+							0.1	I
Trachelospermum lucidum				+						+						+				I
Viburnum coriaceum					+															
V. erubescens										1									0.1	
Betula utilis		+																		
Carpinus viminea							1	+											0.1	I
Cleyera japonica var. *wallichiana*							+	1	+		+						1		0.1	I
Dobinea vulgaris						+														
Elatostema obtusum															+					
Ficus foveolata																+	+			I
Hedera nepalensis														1					0.1	
Machilus duthiei		+																		
Pilea obtusa																1			0.1	
P. smilacifolia	+										+					+		+		I
Pimpinella diversifolia		+																		
Piper peepuloides									+				+	+	3				0.2	I
Polygonum chinense					+				+											I
Quercus glauca			+					+			+		+		+					I
Q. lineata	+																	+		I
Rubus diffusus												+								
R. rugosus		+	+		+							1	+	+		+			0.1	II
Sanicula eleta												+								
Saurauja napaulensis												+		1					0.1	I
Tetrastigma semiserrata	+		+	+	+	+		+	+		+			+	+			+		III
Viola serpens					+	+					+	+					+	+		II
Xylosma controversum		+																		
Zanthoxylum oxyphyllum					+															
Carex cruciata	6	3	2	2	3	2	5	4	3	4	5	2		+		1	3	2	2.6	IV
C. ligulata													2	1					0.2	I
C. longipes													4						0.2	
Cautleya spicata			+				+											+		I
Chlorophytum nepalense																		+		
Ophiorhiza		+																		
Oplismenus compositus	+	+	2	1	+			1		-	+	+	+	1	1		1	2	0.5	IV
Smilax menipermoidea		+																+		I
Athyrium drepanopterum		1		1	1	+		+	+	-	2	2		2	2		2	2	0.8	IV
Dryopteris lepidopoda	1		1											+		1		+	0.2	I
D. odontoloma													1				+		0.1	I
Polystichum squarrosum	1				2							1							0.2	I
Pteris cretica											+		+	2	1			+	0.2	I
P. quadriaurita																	1		0.1	
Selaginella		+	1	+				1	2			3	1	2	+	2	+	5	0.9	III
Thelypteris xylodes						1	1	+		1						+			0.3	I
Mnium								+	3										0.2	I
Rhodobryum				+	+											1	+	+	0.1	I
Other mosses	1							+	1										0.1	I

Table 18. Floristic Composition of Evergreen Oak Forest (Plot No. 65).

Canopy Plot & Quadrat No. (10m x 10m)	65–158
1st Layer	
Height m	14
Number of Species	1
Coverage %	40
Quercus lineata	4
2nd Layer	
Height m	5~8
Number of Species	4
Coverage %	80
Lyonia ovalifolia	+
Cleyera japonica var. *wallichiana*	+
Lindera pulcherrima	3
Quercus lineata	5
Shrub Layer	
Height m	0.7 ~2
Number of Species	13
Coverage %	50
Caryopteris foetida	+
Ligustrum indicum	+
Myrsine semiserrata	2
Strobilanthes atropurpureus	+
Viburnum coriaceum	+
Indigofera pulchella	+
Lindera pulcherrima	2
Rhamnus nepalensis	+
Rubus diffusus	+
R. rugosus	+
Arundinaria maling	3
Cautleya spicata	+
Polystichum squarrosum	+

Herb Layer Plot & Quadrat No. (1mx1m)	65–158– 1	2	3	M	C
Height cm	0~ 20	5~ 30	5~ 20	3~ 23	
Number of Species	9	7	10	9	
Coverage %	40	40	50	43	
Myriactis nepalensis	+				II
Myrsine semiserrata	+	+	+		V
Ophiorrhiza prostrata	+				II
Strobilanthes atropurpureus			+		II
Indigofera pulchella	+		+		III
Lindera pulcherrima		+			II
Parthenocissus semicordata			1	0.3	II
Piper peepuloides		1	2	1.0	III
Quercus lineata		+			II
Rubus rugosus		+			II
Tetrastigma semiserrata	+				II
Carex cruciata			1	0.3	II
C. longipes	3	2	3	2.7	V
Oplismenus compositus			1	0.3	II
Athyrium drepanopterum	+				II
Polystichum squarrosum	+	1	+	0.3	V
Selaginella	+				II
Mosses			+		II

Table 19. Floristic Composition of Evergreen Oak Forest (Plot No. 68).

Plot & Quadrat No. (10m x 10m)	68–163
1st Layer	
Height m	8
Number of Species	4
Coverage %	95
Castanopsis tribuloides	2
Eurya acuminata	+
Myrica esculenta	1
Quercus lineata	7
Shrub Layer	
Height m	1~2
Number of Species	18
Coverage %	40
Fraxinus floribunda	+
Gaultheria fragrantissima	+
Lyonia ovalifolia	+
Myrsine semiserrata	1
Symplocos theaefolia	+
Carpinus viminea	+
Castanopsis indica	+
C. tribuloides	2
Codariocalyx motorius	+
Eurya acuminata	+
Machilus duthiei	+
Myrica esculenta	+
Osbeckia stellata	+
Phyllanthus parvifolius	+
Quercus lineata	1
Q. spicata	+
Schima wallichii	+
Arundinaria maling	+

Herb Layer Plot & Quadrat No. (1m x 1m)	68–163– 1	2	3	M	C
Height cm	0~ 20	0~ 15	5~ 30	2~ 22	
Number of Species	12	7	7	9	
Coverage %	60	50	50	53	
Ainsliaea latifolia	2	2	4	2.7	V
Isodon coetsa	+	+	1	0.3	V
Myrsine semiserrata	+	+	+		V
Scutellaria discolor	1			0.3	II
Carpinus viminea			+		II
Castanopsis tribuloides	+				II
Lespedeza eriocarpa	+	+			III
Indigofera pulchella	+				II
Phyllathus parvifolius	+	+			III
Quercus lineata	+				II
Carex longipes	3	1	1	1.7	V
Selaginella	+				II
Thuidium	4	4	+	2.7	V

Table 20. Floristic Composition of Broadleaved Forest (Plot No. 8).

Canopy Plot & Quadrat No. (10m x 10m)	8– 23	24	25	26	27	M	C
1st Layer							
Height m	15~10	18	25	20	20	20	
Number of Species	4	3	4	4	3	4	
Coverage %	90	60	95	90	95	86	
Acer oblongum	4		4			1.6	II
Albizia mollis				4		0.8	I
Castanopsis tribuloides			3			0.6	I
Eriobotrya hookeriana					1	0.2	I
Lindera pulcherrima	1					0.2	I
Machilus duthiei	3	2			8	2.6	III
Machilus				2		0.4	I
Michelia kisopa		3	1		5	1.8	III
Phoebe lanceolata	1	4	3	+		1.6	IV
Quercus glauca				4		0.8	II
2nd Layer							
Height m	7~4	10~5	8~3	6~2	5~2	7~3	
Number of Species	3	2	2	2	2	2	
Coverage %	20	60	20	15	+	23	
Acer oblongum	+						I
Camellia kissii		6		2		1.6	II
Castanopsis tribuloides			3			0.6	I
Lindera pulcherrima	1					0.2	I
Machilus duthiei					+		I
Michelia kisopa			1			0.2	I
Myrsine semiserrata		1				0.2	I
Phoebe lanceolata				1		0.2	I
Quercus spicata	3				+	0.6	II
Shrub Layer							
Height m	2–1	2~1	2–1	2~1	1	2~1	
Number of Species	17	16	12	11	6	12	
Coverage %	80	60	30	30	60	52	
Acer oblongum	+						I
Albizia mollis			+				I
Camellia kissii		3	+	+		0.6	III
Caryopteris grata	+	+	+	+	+		V
Castanopsis tribuloides			+	+			II
Cinnamomum tamala	+						I
Daphne bholua				+			I
Disporum cantoniense	+						I
Dodecadenia grandiflora	1	+			+	0.2	III
Eurya cerasifolia	+						I
Ligustrum nepalense			+	+			II
Lindera pulcherrima	+	2	2	+	+	0.8	V
Machilus duthiei		+		+			II
Mahonia napaulensis			+				I
Hypericum uralum		+					I
Phoebe lanceolata	+						I
P. pallida				2		0.4	I
Pilea cristata		+					I
Pogostemon amaranthoides		+					I
Quercus lanuginosa			+				I
Q. spicata	2	+	+		+	0.4	IV
Rubia manjith	+	+					II
Rubus ellipticus		+	+				II
R. paniculatus	+						I
Sarcococca coriacea				+			I
S. hookeriana	4	2	+	+	5	2.2	V
Tetrastigma serrulata	+	+					II
Carex baccans		+					I
Microlepia speluncea	+						I
Polystichum aculeatum	+	+	+	+	+		V
P. setiferum	1	+				0.2	II
Pteris wallichiana	+						I

Herb Layer Plot & Quadrat No. (1m x 1m)	8–23– 1	2	3	8–24– 1	2	3	8–25– 1	2	3	8–26– 1	2	3	8–27– 1	2	3	M	C
Height cm	30~10	30~10	30~10	30~10	30~10	30~10	30~10	30~10	30~10	20~10	20~10	20~10	30~10	30~10	20~10	27~10	
Number of Species	13	9	14	11	9	8	9	8	10	10	8	7	9	6	6	9	
Coverage %	85	60	80	90	90	85	95	60	60	80	60	60	60	80	40	72	
Acer oblongum					+												
Aster												+					
Boenninghausenia albiflora							1	+								0.1	I
Camellia kissii			+							+							I
Caryopteris grata				+													
Dodecadenia grandiflora	+												1			0.1	I
Elatostema sessilifolia	1	2	5		+					+						0.5	II
Ficus foveolata										+							
F. neriifolia											+						
Galium asperifolium				1	2	1										0.3	I
Gentiana capitata				+						+		+	+				I
Hedera nepalensis			+							+	+						I
Hydrocotyle javanica	+	+						1	+							0.1	I
H. nepalensis				+		+				+	1	1	+			0.1	II
Lysimachia alternifolia											+						
Michelia kisopa												+					
Myriactis nepalensis	+				+	+											I
Myrsine semiserrata				+													
Hypericum uralum				+		+											I
Ophiorhiza fasciculata	1	+	+				+	+	+		+					0.1	III
Pilea crinita									+								
Piper peepuloides			+														
Polygonum microcephala	1		+	2	+											0.2	I
Quercus spicata							+										
Rhynchospermum verticillatum							1	+	+	+	1	+				0.1	II
Rubia manjith		+															
Sarcococca hookeriana			+										+	+			I
Tetrasperma serrulata			+														
Viola							+		+		+						I
Capillipedium assimile				1	6	+	4	3	1							1.0	II
Carex cruciata	2	2	1		2		3		+				1	1	+	0.8	III
C. longipes	1	2	5	4	5	5		3	2	+			1	1	1	2.0	IV
Goodyera repens		+															
Ophiopogon intermedia							+										
Oplismenus compositus	1		+	1		1								+		0.2	II
Dennstaedtia appendiculata						1										0.1	
Dryopteris sparsa												+					
Microlepia speluncea	1															0.1	
Polystichum aculeatum							1	1	2							0.2	I
P. setiferum	1	1	1	1	1								1	1	+	0.5	III
Pteris pellucida	1		+					+	+	+			+			0.1	II
P. wallichiana															1	0.1	
Selaginella monospora	1	+	+													0.1	I
Moss															+		

Table 21. Floristic Composition of Broadleaved Forest (Plot No. 34).

Canopy Plot & Quadrat No. (10m × 10m)	34- 79	80	81	82	83	84	M	C
1st Layer								
Height m	23						23	
No. of Species	4	2	2	2	4	2	3	
Coverage %	100	100	100	95	100	90	98	
Acer campbellii	7	8					2.5	II
Alnus nepalensis	1						0.2	I
Juglans regia			6	4	2	2	2.3	III
Lindera bifaria	5	3	5	7	6	9	5.8	V
Machilus duthiei	+				3		0.5	II
Meliosma dilleniifolia					1		0.2	I
2nd Layer								
Height m		10	10	10	10	10	10	
No. of Species	0	2	1	1	2	1	1.2	
Coverage %		30	+	+	40	20	15	
Lindera bifaria		3			+	2	0.8	III
Machilus duthiei		+	+	+	4		0.7	III
Shrub Layer								
Height m	3~ 1	2~ 0.5	1~ 0.5	1.5~ 0.5	2~ 1	2~ 1	1.9~ 0.75	
No. of Species	4	6	3	5	5	3	4.3	
Coverage %	+	+	+	20	+	+	3.3	
Acer pectinatum				+	+			II
Daphne bholua		+		+				II
Elaeagnus		+						I
Girardinia heterophylla	+				+	+		III
Lindera bifaria	+	+	+	1	+			IV
Machilus duthiei		+	+	+				III
Meliosma dilleniifolia	+							I
Senecio acuminatus		+			+	+		III
Senecio	+							I
Viburnum erubescens		+						I
Urtica parviflora			+	2	+	+	0.3	III

Herb Layer Plot & Quadrat No. (1m x 1m)	34-79- 1	2	3	34-80- 1	2	3	34-81- 1	2	3	34-82- 1	2	3	34-83- 1	2	3	34-84- 1	2	3	M	C
Height cm	20~ 5	30~ 5	30~ 10	30~ 5	30~ 5	25~ 5	30~ 5	40~ 5	20~ 5	20~ 0	30~ 0	20~ 0	30~ 10	30~ 5	25~ 5	25~ 0	20~ 0	30~ 5	30~ 4.2	27~
No. of Species	5	7	7	8	9	11	4	5	5	4	9	8	5	7	5	5	5	7	6	
Coverage %	20	40	40	50	60	20	40	80	40	75	30	30	30	30	40	50	80	30	43.6	
Acer pectinatum											2	+							0.1	I
Achyranthes aspera		+		+								1		2					0.2	I
Achyranthes bidentata	1	2	+	2	3			7	1	1				+			6	+	1.3	III
Boehmeria sidaefolia							3						+			1			0.2	I
Daphne bholua				+	+	+														I
Elatostema surculosa		1			+	+								+					0.1	I
Girardinia heterophylla					+															
Gynostemma pentaphylla		+					1				1		+		+	4			0.3	II
Hedera nepalensis		+				1													0.1	I
Hyptis suaveolens	2		2	+	1	2			+		+	2			3	2	1		0.8	III
Impatiens							1						3		+	+		1	0.3	I
Lindera bifaria				2							+								0.1	I
Parthenocissus semicordata											+									
Pilea scripta	+		2	1	2	+			+	+				+					0.3	II
Rubia cordifolia								+	1										0.1	I
Sanicula elata											+									
Senecio acuminatus			1			+							1						0.1	I
Solanum crassipetalum								1		6				1			+		0.4	I
Stephania hernandifolia					+	+	+											+		I
Urtica parvifolia										2	+	+							0.1	I
Viola serpens		1	+																0.1	I
Arisaema concinnum													+							
Arisaema tortuosum						+					+	+			1				0.1	I
Arisaema						+														
Calanthe plantaginea						+														
Capillipedium assimile																		+		
Cautleya lutea												1							0.1	
Ophiopogon clarkei												+								
Oplismenus compositus	1							1	3								1		0.3	I
Smilax menispermoidea					+															
Pteris	+		+	+										+						I
Leskea			1	2				+											0.2	I
Thuidium		2			1	+					+	1		2	1	+	+	+	0.4	III

Table 22. Floristic Composition of Broadleaved Forest (Plot No. 49).

Canopy Plot & Quadrat No. (10m x 10m)	49–109	49–110
1st Layer		
Height m	14 ~ 8	14 ~ 7
No. of Species	16	11
Coverage %	100	100
Measurement has been done by means of basal area because of bad visibility of canopy. See Table 57.		
Shrub Layer		
Height m	2~1	1~0.5
No. of Species	6	6
Coverage %	+	+
Acer oblongum	+	+
Mahonia napaulensis	+	+
Maytenus rufa	+	+
Piper mullesua		+
Quercus glauca	+	+
Xylosma controversa	+	+
Smilax asper	+	
S. lanceifolia		+

Herb Layer Quadrat No. (1m x 1m)	49–109–			49–110–				
	1	2	3	1	2	3	M	C
Height cm	10	10	10	10	10	10	10	
No. of Species	6	4	2	5	5	6	5	
Coverage %	+	10	+	+	+	+	+	
Machilus duthiei	+	+		+	+	+		IV
Piper mullesua	+							I
Pyrus pashia		+						I
Strobilanthes atropurpureus	+							I
Trachelospermum lucidum	+	1	+		+	+	0.2	IV
Viola serpens		+						I
Xylosma controversa			+					II
Ziziphus mauritiana				+		+		II
Ophiopogon clarkei	+			+	+	+		III
Smilax asper						+		I
Fern *2747*	+				+			II

Table 23. Floristic Composition of Broadleaved Forest (Plot No. 67).

Canopy Plot & Quadrat No. (10m x 10m)	67–161	67–162	M	C
1st Layer				
Height m	17	17	17	
Number of Species	1	2	2	
Coverage %	100	100	100	
Carpinus viminea	10	10	10	V
Quercus glauca		1	0.5	III
2nd Layer				
Height m	5~7	7	6~7	
Number of Species	7	3	4	
Coverage %	50	70	60	
Myrsine semiserrata	+			III
Symplocos theaefolia	+	1	0.5	V
Acer oblongum		3	1.5	III
Carpinus viminea	2		1.0	III
Euonymus acuminatus			0.5	III
Ilex umbellulata	+			III
Lindera pulcherrima		3	1.5	III
Maytenus rufa	2		1.0	III
Schima wallichii	+			III
Shrub Layer				
Height m	0.6~1.5	1~1.5	0.8~ 1.5	
Number of Species	18	11	14	
Coverage %	20	20	20	
Myrsine semiserrata	1	1	1.0	V
Symplocos theaefolia	+			III
Viburnum erubescens	+			III
Acer oblongum		+		III
Castanopsis tribuloides	+	+		III
Dobinea vulgaris		+		III
Euonymus		+		III
Eurya acuminata	1	+	0.5	V
Lindera pulcherrima	+	1	0.5	V
Machilus duthiei	+	+		V
Myrica esculenta	+			III
Pilea symmerica	+			III
Piper peepuloides	+			III
Quercus glauca	+			III
Quercus spicata	+			III
Rubus rugosus	+	+		V
Sarcococca coriacea	+	+		V
Schima wallichii	+			III
Xylosma controversa	+			III
Smilax aspera	+			III
S. ferox	+	+		V

Herb Layer Plot & Quadrat No. (1m x 1m)	67–161–			67–162–				
	1	2	3	1	2	3	M	C
Height cm	10~ 30	0~ 20	0~ 20	0~ 20	5~ 30	5~ 30	3~ 25	
Number of species	7	8	6	8	8	7	7	
Coverage %	25	40	60	40	60	30	43	
Ainsliaea latifolia		1				+	0.2	II
Craniotome furcata					+			I
Myriactis nepalensis		+	+					II
Myrsine semiserrata	1	+	+		+	+	0.2	IV
Ophiorrhiza prostrata						+		I
Strobilanthes atropurpureus	+				1		0.2	II
Trachelospermum lucidum	1	+	1	1			0.5	III
Hedera nepalensis				1	1	1	0.5	III
Machilus duthiei	+							I
Parthenocissus semicordata			+					I
Piper peepuloides	1			1	2		0.7	III
Polygonum filiforme				+	+			II
Quercus spicata		+						I
Carex finitima	1	1	2	3	3	1	1.8	V
Globba clarkei		2			+		0.3	II
Smilax ferox				+				I
Thysanolaena maxima				+				I
Athyrium drepanopterum				+				I
Pteris cretica						+		I
Mosses	+	1	5			2	1.3	III

Table 24. Floristic Composition of Broadleaved Forest (Plot No. 103, 104 & 105).

Canopy Plot & Quadrat No. (10m × 10m)	103–202	104–203	105–204	M	C
1st Layer					
Height m	5~7	10	10~12	10	
No. of Species	6	4	3	4	
Coverage %	80	80	60	73	
Daphniphyllum himalaicum	+	2		0.7	III
Lindera pulcherrima	1			0.3	II
Lyonia ovalifolia	4		2	2.0	III
Quercus semecarpifolia		+			II
Rhododendron arboreum	1	2		1.0	III
Rhus succedanea	1			0.3	II
Symplocos pyrifolia	4	4	5	4.3	V
Zanthoxyllum armatum			+		II
2nd Layer					
Height m	2~3	3~5	2~5	4	
No. of Species	7	8	3	6	
Coverage %	70	50	70	63	
Daphniphyllum himalaicum		1		0.3	II
Eurya acuminata	+	+			III
Ilex dipyrena		+	+		III
Mahonia napaulensis	3	1	1	1.7	V
Lindera pulcherrima	+				
Quercus semecarpifolia	+	1		0.3	III
Pieris formosa		1		0.3	II
Quercus lamellosa	+				II
Rhododendron arboreum	2	2		1.3	III
Symplocos pyrifolia	3	2	6	3.7	V
Shrub Layer					
Height m	0.5~1.5	1	1	1.2	
No. of Species	14	13	4	10	
Coverage %	70	40	40	50	
Daphne bholua	1	1		0.7	III
Daphniphyllum himalaicum		+			II
Eurya acuminata	+	+			III
Ilex dipyrena		+	+		III
Ligustrum nepalense	+				II
Lindera pulcherrima	+				II
Mahonia napaulensis	1	2		1.0	III
Pieris formosa		1		0.3	II
Quercus semecarpifolia		+			II
Rhododendron arboreum	+	+			III
Sarcococca coriacea		+	+		III
S. hookeriana	2	3		1.7	III
Senecio	+		1	0.7	III
Symplocos pyrifolia	1			0.7	II
Viburnum erubescens	+	+	+		V
Carex cruciata	2			0.7	II
Smilax menispermoidea	+				II
S. rigida	2			0.7	II
Peranema cyatheoides	2	1		1.0	III
Dryopteris wallichiana		1		0.3	II

Herb Layer Quadrat No. (1m × 1m)	103–202– 1	2	3	104–203– 1	2	3	105–204– 1	2	3	M	C
Height cm	10~30			10~30			10~30			30	
No. of Species	14	10	8	13	13	9	5	9	8	10	
Coverage %	50	50	30	50	40	40	20	20	20	36	
Boehmeria		+									I
Fragaria nubicola		+			+						I
Elatostema obtusa				+					+		I
Euonymus				+	+	+	+				II
Eurya acuminata	+					+		+			II
Galium hirtiflorum								+			I
Gomphogyne cissiformis									+		I
Daphniphyllum himalaicum						+					I
Hedera nepalensis	+		+	+							II
Holboelia latifolia		+			+						I
Hydrangea anomala	+		+								I
Hydrocotyle nepalense		+									I
Hypericum uralum		+									I
Lonicera (vine)					+				+		I
Ligustrum nepalense				+	+						I
Lysimachia debilis		+							+		I
Myriactis nepalensis	+		+								I
Osmorrhiza			+								I
Peracarpa carnosa	+			+	+						II
Phromis	1									0.1	I
Pimpinella diversifolia	+	+			+	+					II
Polygonum molle	+		+		+			+			II
Sanicula elata	+								+		I
Sarcococca hookeriana	+	1	+			+				0.1	II
Strobilanthes atropurpreus				+		+	+	+	+		III
Viola serpens				+							I
Zanthoxylum armatum					+						I
Campylandra				+		+					I
Carex	1	2	+	2	1			+	+	0.7	IV
Ophiopogon								+			I
Oplismenus compositus				+	+	+					II
Smilax menispermoidea			+	+			+	+			II
S. rigida								+	+		I
Coniogramme caudata	+										I
Dryopteris wallichii	+	2			1		1			0.4	II
Peranema				1		1				0.2	I
Polystichum							+				I
Thelypteris	+										I
Fern *0754*				1	+			+		0.1	II

Table 25. Floristic Composition of *Quercus semecarpifolia* Forest (Plot No. 33).

Canopy Plot & Quadrat No. (10m x 10m)	33– 73	74	75	76	77	78	M	C
1st Layer								
Height m	24						24	
No. of Species	1	1	1	2	1	1	1	
Coverage %	80	90	90	80	95	85	87	
Quercus semecarpifolia	8	9	9	8	10	9	8.8	V
Rhododendron arboreum var. *campbelliae*				+				I
Shrub Layer								
Height m	2	2~1	2~0.5	2~1	2	3~1	2	
No. of Species	3	2	4	4	1	4	3	
Coverage %	+	+	+	+	+	1	0.2	
Berberis aristata		+	+			+		III
Ilex dipyrena	+			+	+	+		III
Pieris formosa				+		+		II
Quercus semecarpifolia	+		+					II
Rhododendron arboreum var. *campbelliae*				+				I
Sarcococca hookeriana			+					I
Senecio acuminatus						+		I
Viburnum erubescens	+	+	+	+				III

Herb Layer Plot & Quadrat No. (1m x 1m)	33–73– 1	2	3	33–74– 1	2	3	33–75– 1	2	3	33–76– 1	2	3	33–77 1	2	3	33–78– 1	2	3	M	C
Height cm	20~5	20~5	20~5	20~5	20~5	20~5	15~0	20~0	20~0	15~0	20~0	30~0	20~0	30~0	20~0	30~0	20~0	20~0	21	
No. of Species	10	9	9	7	9	10	7	8	7	6	8	9	8	10	7	7	10	7	8	
Coverage %	70	70	50	75	70	90	80	80	80	70	60	70	60	70	40	80	70	60	69	
Achyranthes bidentata		+			+						+	+					+			I
Ainsliaea pteropoda	3	3	2	1	2	2	+	2	1	3	3	2		4	1	4	+	1	1.9	V
Berberis aristata																		+		
Circaea alpina	+	1	1			+		1	+		+					1	+	+	0.2	III
Clematis montana														+		+				I
Didymocarpus														+			+			I
Elatostema obtusa							+					+								I
Galium hirtiflorum														+						
Hedera nepalensis					+							+								I
Impatiens									+						+					I
Pilea			1														+		0.1	I
Polygonum molle	+	+	+										+	1					0.1	I
Quercus semecarpifolia																	+			
Rubia cordifolia			+	+	+		+	+		+	+				+					II
Sarcococca hookeri												1							0.1	
Ainsliaea aptera			+	1	+			+											0.1	I
Stellaria monosperma				+		+					+		+							I
Strobilanthes atropurpureus				+		+				1		2				+	1	+	0.2	II
Strobilanthes 2372	+	1					1		2					1					0.3	I
Thalictrum 2375													1						0.1	
Tetraspermum serrulatum	+																			
Arisaema concinnum	+																+			I
Arisaema erubescens																3			0.2	
Arisaema utile														+	+					I
Arisaema						+														
Carex 2376	1	2	+	+	1		1	1	+	2	4	+	+	1	2	1	3	4	1.3	V
Loxogramme					+															
Polypodium						+														
Polypodium													+	+	+					I
Fern *2373*	4	3	1	5	2	7	6	6	6	4	+	4	5	3	3	3	3	3	3.8	V
Fern *2374*		+				1													0.1	I
Leptodontium	+																			
Plagiochila					2	1							+						0.2	I
Moss	+	+	1			1	1	1		+		1	+					1	0.3	III

Table 26. Floristic Composition of *Quercus semecarpifolia* Forest

Canopy Plot & Quadrat No. (10m x 10m)	44– 100	101	102	103	104	105	M	C
1st Layer								
Height m	15						15	
No. of Species	1	1	2	1	1	1	1	
Coverage %	95	90	95	80	90	70	87	
Quercus semecarpifolia	10	9	10	8	9	7	8.8	V
Sorbus hedlundi			+					I
2nd Layer								
Height m		6	5	8~ 5	4	7~ 5	5	
No. of Species		1	1	1	1	2	1	
Coverage %		+	15	40	+	30	14	
Rhododendron arboreum var. *campbelliae*		+		4		3	1.2	III
Sorbus hedlundi			2		+	+	0.3	III
Shrub Layer								
Height m	2~ 0.5	2~ 0.5	2~ 0.5	1.5~ 0.5	2~ 0.5	2~ 0.5		
No. of Species	3	3	5	4	5	7	5	
Coverage %	5	5	+	10	+	60	13	
Aster						+		
Cotoneaster acuminatus	+	1	1	1	+	2	0.8	V
Daphne bholua	+		+			+		III
Jasminum humile			+		+			II
Leptodermis lanceolata	1	+	1	+	+	3	0.7	V
Lonicera obovata					+			I
Rhododendron arboreum var. *campbelliae*						+		I
Rhododendron lepidotum		+	+	+		+		III
Ribes glaciale					+			I
Salix				+				I
Sorbus hedlundi						+		I

Herb Layer Quadrat No. (1m x 1m)	44–100– 1	2	3	44–101– 1	2	3	44–102– 1	2	3	44–103– 1	2	3	44–104– 1	2	3	44–105– 1	2	3	M	C
Height cm	20~ 5	30~ 10	20~ 5	15~ 5	20~ 5	20~ 5	30~ 5	40~ 0	40~ 0	20~ 0	30~ 5	20~ 5	40~ 10	40~ 5	25~ 5	40~ 10	40~ 0	20~ 5	28~ 5	
No. of Species	8	8	8	9	9	12	11	8	10	7	11	9	10	13	11	6	17	15	10	
Coverage %	60	80	70	70	40	80	80	70	80	90	50	70	60	90	80	60	70	60	70	
Acronema tenerum		+					+	+	+					+		+	1		0.1	II
Anaphalis margaritacea																	+	+		I
Angelica													2	+					0.1	I
Aster												+								
Bistorta amplexicaule	2	6	5	+	1	+	5	1	5	1	2	+	2	2	+	1	2	+	1.9	V
Cacalia quinqueloba				1														+	0.1	I
Circaea alpina	+	+	1	+	+	+	+			+	+		+	+	+		+	+	0.1	IV
Clematis montana															+					
Cotoneaster acuminatus					+															
Geranium gerardianum											+									
Heracleum											1		+						0.1	I
Hypericum uralum														1					0.1	
Leptodermis lanceolata				+													+	+		I
Myriactis nepalensis														+	+		+			I
Rhododendron lepidotum									+											
Saxifraga diversifolia																		+		
Sedum							+													
Senecio alatus						+					+	+				3		2	0.3	I
Strobilanthes atropurpureus				+																
Strobilanthes nutans	3			5	2	5			1	8	2	7	+	5	5	3	+	3	2.7	IV
Thalictrum foliolosum			1			+	+						+	+	+		+		0.1	II
Triplostegia glandulifera	1					+					+								0.1	I
Viola biflora	+				1	+	+		+	+	+		1		+	+	1	+	0.2	III
Zanthoxylum alatum								+												
Allium wallichii	+		+	+	+	+	1					+	2	1	2		+		0.3	III
Arisaema utile							+		+					+						I
Juncus leucomelas																		+		
Lilium nepalense															+					
Polygonatum verticillatum			+	+	+	+					+	+					+			II
Roscoea alpina																	+	+		I
Gramineae *2622*	1		+	1	1	2	+		+	+	1	+	+	1	1	+	3	2	0.7	IV
Polypodium 2619	2	1			+			2	+	+	+	+	1	+			+		0.3	III
Fern *2623*		2	+			1	3	2	2						2		+		0.7	II
Fern *2631*																		+		
Entodon		+						2						+					0.1	I
Leptodontium		+	+					1		+		+					+	+	0.1	II
Thuidium		+				+	+	1	+									1	0.1	II

Table 27. Floristic Composition of *Quercus semecarpifolia* Forest (Plot No. 50).

Canopy Plot & Quadrat No. (10m x 10m)	50–111
1st Layer	
Height m	18
No. of Species	1
Coverage %	70
Quercus semecarpifolia	7
2nd Layer	
Height m	10
No. of Species	8
Coverage %	30
Eriobotrya hookeri	+
Lindera pulcherrima	+
Lyonia ovalifolia	1
Myrica rubra	1
Quercus semecarpifolia	1
Rhododendron arboreum	1
Symplocos crataegoides	1
Viburnum stellatum	+
Shrub Layer	
Height m	3~2
No. of Species	11
Coverage %	30
Aristolochia griffithii	+
Cochlianthus gracilis	+
Daphne bholua	+
Holboellia latifolia	+
Lindera pulcherrima	+
Lyonia ovalifolia	+
Myrsine semiserrata	+
Tetrastigma serrulatum	+
Thalictrum foliolosum	+
Arundinaria hookeriana	3
Smilax menispermoidea	+

Herb Layer Quadrat No. (1m x 1m)	50–111– 1	 2	 3	 M
Height cm	50~ 15	100~ 20	50~ 30	67~ 22
No. of Species	15	11	15	14
Coverage %	50	80	60	63
Ainsliaea pteropoda	1			0.3
Aristolochia griffithii		1		0.3
Boehmeria platyphylla		1	2	1.0
Circaea alpina			+	
Clinopodium umbrosum		+		
Cochlianthus gracilis	2	1	+	1.0
Craniotome versicolor			+	
Daphne bholua	+			
Dipsacus atratus			+	
Hedera nepalensis	+			
Leucas mollissima	+			
Myriactis nepalensis			+	
Myrsine semiserrata	+	+		
Polygonum nepalense			+	
Rubus acuminatus		+		
Shuteria vestita		2	2	1.3
Strobilanthes atropurpureus	1	+	+	0.3
Tetrastigma serrulata	1			0.3
Thalictrum foliolosum	+	+		
Chlorophytum nepalense			+	
Hedychium ellipticum	2	8	+	3.3
Ophiopogon clarkei	+		1	0.3
Roscoea purpurea			+	
Smilax menispermoidea	+		1	0.3
Polystichum	2		1	1.0
Pteris cretica		+		
Plagiochila	1			0.3
Thuidium	+			

Table 28. Floristic Composition of *Quercus semecarpifolia* Forest (Plot No. 61).

Canopy Plot & Quadrat No. (10m x 10m)	61– 134	135	136	137	138	139	M	C
1st Layer								
Height m	20	20	20	20	20	20	20	
Number of Species	1	1	1	1	1	1	1	
Coverage %	50	70	40	50	60	80	58	
Quercus semecarpifolia	5	7	4	5	6	8	5.8	V
2nd Layer								
Height m	5~7	3~5	5~8	4~8	4~8	5~8	4~7	
Number of Species	2	3	3	2	3	3	3	
Coverage %	+	30	60	20	40	10	26	
Euonymus tingens		3	5	2	+	1	1.8	IV
Quercus semecarpifolia	+	+	1		4	+	0.8	IV
Shrub Layer								
Height m	0.5~ 2	1~ 2	1~ 3	1~ 2	1~ 2	1~ 2	1~ 2	
Number of Species	6	4	4	5	2	3	4	
Coverage %	+	10	+	15	10	10	8	
Colquhounia coccinea	+	+		+				III
Dipsacus atratus				+	+			II
Leucosceptrum canum	+							I
Priotropis cytisoides			+			+		II
Berberis aristata			+			1	0.2	II
Daphne bholua	+							I
Euonymus tingens			+					I
Ilex dipyrena	+							I
Quercus semecarpifolia	+	+	+	+				III
Thalictrum foliolosum		+						I
Arundinaria maling		1		1	1	1	0.7	III
Smilax menispermoidea	+			+				II

Herb Layer Plot & Quadrat No. (1m x 1m)	61–134–			61–135–			61–136–			61–137–			61–138			61–139–				
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	M	C
Height cm	5~ 20	10~ 25	10~ 30	5~ 25	5~ 30	10~ 30	10~ 30	5~ 15	10~ 30	5~ 30	5~ 30	5~ 20	5~ 15	10~ 30	5~ 20	5~ 20	5~ 30	5~ 20	7~ 25	
Number of Species	10	11	13	11	9	11	12	11	13	13	11	11	10	12	9	11	13	11	12	
Coverage %	70	90	90	95	90	85	95	70	80	95	90	90	80	90	90	80	80	90	86	
Ainsliaea latifolia	5		2	3			+	+	2	8			+	5	+	5	2		1.8	III
Caryopteris foetida									1										0.1	
Ceropegia pubescens											+									
Dipsacus atratus				+					+	+				+						I
Galium hirtiflorum												+								
Gentiana capitata																	+	+		I
Myriactis nepalensis			+									+								I
Porana grandiflora						+														
Priotropis cytisoides																	+	+		I
Rubia wallichiana	+		+							+			+	+				+		II
Strobilanthes atropurpureus	2	5	4	5	6	3	7	5	2	1	2	1	4	1	1	+	4	5	3.2	V
Tripterospermum volubile					+															
Valeriana hardwickii								+												
Labiatae		1											2					1	0.2	I
Cochlianthus gracilis	+	+		+		1	1		+	+	+	+		+		+	+		0.1	III
Daphne bholua				+																
Heracleum nepalense	+		1		1	2	+	1	2	+	1	2	1	3	3	1	+	1	1.1	IV
Impatiens falcifer									+								+	+		I
Laportea terminalis	+	+	+			1						+				1			0.1	II
Pilea						1										1			0.1	I
Polygonum runcinatum		+	+				+			+			+		1	+		+	0.1	II
Quercus semecarpifolia		+		+		+											+			I
Sanicula elata		+			+		+	+					+			+				II
Stellaria monosperma			+		+			+	+	+										I
Thalictrum foliolosum					2										+				0.1	I
T. javanicum								+			+	+					+			I
Viola serpens	+	+	+	+	+	+	+	+	+	+	+		2	+	+	+	+	3	0.3	V
Arundinaria maling						4							+			+			0.2	I
Carex cruciatus		2					+	2			8	7		4	3		2		1.6	II
C. longipes	1	+	2	+	2	1	1	1	+	+		+		+		+	+		0.4	IV
Chlorophytum nepalense				+					+					+				+		I
Cyanotis vaga						+					+					+				I
Smilax menispermoidea			+						+	+										I
Athyrium tenellum		2	+	+			+	+	+		2	1	+	1	1		1		0.4	III
Selaginella	+									+										I
Mosses	+																			

Table 29. Floristic Composition of *Quercus semecarpifolia* Forest (Plot No. 62)

Canopy Plot No. Quadrat No. (10m x 10m)	62– 140	141	142	143	144	145	M	C
1st Layer								
Height m	20	20	20	20	20	20	20	
Number of Species	1	1	1	1	1	1	1	
Coverage %	80	70	60	80	40	65	66	
Quercus semecarpifolia	8	7	6	8	4	7	6.7	V
2nd Layer								
Height m	10	5	8	4~6		3~4	4~7	
Number of Species	1	3	1	4	0	3	2	
Coverage %	40	10	10	40	0	40	23	
Rhododendron arboreum	4		1				0.8	II
4831				2		3	0.8	II
Dodecadenia grandiflora		1		1			0.3	II
Lindera pulcherrima				1			0.2	I
Meliosma dilleniifolia						+		I
Quercus semecarpifolia		1		+			0.2	II
4820		1				1	0.3	II
Shrub Layer								
Height m	2	1~2	1~5	1~3	1~2	1~2	1~3	
Number of Species	2	4	2	4	3	2	3	
Coverage %	+	10	15	35	50	10	20	
Symplocos theaefolia		1	1	1			0.5	III
Berberis chitria					1	1	0.3	II
Dodecadenia grandiflora	+	1					0.2	II
Symplocos ramosissima	+	1					0.2	II
Arundinaria maling				1	3	1	0.8	III
4821		+						I
4820			1	1	1		0.5	III
4832				1			0.2	I

Herb Layer Plot & Quadrat No. (1m x 1m)	62–140–			62–141–			62–142–			62–143–			62–144–			62–145–			M	C
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
Height cm	20~ 30	20~ 20	0~ 40	0~ 30	5~ 25	5~ 20	0~ 30	5~ 30	5~ 30	5~ 30	5~ 30	5~ 30	5~ 50	15~ 30	5~ 50	5~ 15	10~ 20	0~ 30	6~ 31	
Number of Species	7	10	7	12	8	10	11	7	9	10	8	10	11	7	9	9	7	10	9	
Coverage %	25	55	75	35	10	15	40	50	60	30	10	30	80	95	70	50	40	40	45	
Anisomeles indica		+					+	+				+		+		+	+			II
Ligustrum indicum							+						1						0.1	I
Myriactis nepalensis	+	+		1		+	1			+	+	1		+	1	+	1		0.2	III
Peracarpa circaeoides																		+		
Rubia wallichiana		+			+	+	1	1	1	+	+	1	1		1	1			0.4	III
Strobilanthes atropurpureus	2	1	4	2	1	1		1	1	2			1	8	2		3		1.6	IV
Boenninghausenia albiflora																		+		
Cochlianthus gracilis				+		+		+		+		+	+			+				II
Daphne bholua	+	+		+	+	+	1		+	+		+	+				+		0.1	III
Lindera pulcherrima		1				+			+								+	1	0.1	I
Polygonum sphaerocephalum				1				+	+		1	1	1		+	1		+	0.3	III
Panax pseudoginseng																		+		
Pilea symmerica		1	1				+		+	+		+	+		1	+	1		0.2	III
Quercus semecarpifolia			+	+	+				+		+							+		II
Sanicula elata							+						+							I
Stellaria monosperma	+																			
Rubus 4832											+	+								I
Viola serpens		+		+		+				+			+							I
Arundinaria maling	+		1	1	+	+						+	1	+	1	+		+	0.2	III
Carex cruciatus	1	2	1	+	+	+	+	1	2	1	+	1	5	+	1	3		+	1.0	V
Hedychium spicatum						+					+							3	0.2	I
Smilax menispermoidea			+																	
Athyrium macdonelli	+	1			1		1		3					+		1	+	+	0.4	II
Dryopteris nigra					+									1					0.1	I
4827							+													
Polystichum								2											0.2	
4823				1															0.1	
4824				+																
4833										1	+								0.1	I
4831										+										
4836															1				0.1	
4837															+					
Mosses			2	1			2												0.3	I

Table 30. Floristic Composition of *Lyonia ovalifolia* Forest (Plot No. 98)

Canopy Plot & Quadrat No. (10m x 10m)	98–197
1st Layer	
Height m	5~8.5
No. of Species	4
Coverage %	30
Lyonia ovalifolia	2
Quercus semecarpifolia	1
Rhododdendron arboreum var. *campbelliae*	1
Symplocos pyrifolia	1
2nd Layer	
Height m	2~4
No. of Species	4
Coverage %	60
Quercus semecarpifolia	1
Rhododendron arboreum	+
var. *campbelliae*	4
Symplocos pyrifolia	2
Shrub Layer	
Height m	1
No. of Species	8
Coverage %	20
Daphne bholua	+
Lonicera	+
Phoebe	+
Rhododendron arboreum var. *campbelliae*	+
Symplocos ramosissima	1
S. pyrifolia	+
Viburnum erubescens	1

Herb Layer Quadrat No. (1m x 1m)	98–197– 1	2	3	M
Height cm	5~20			5~20
No. of Species	9	6	8	8
Coverage %	20	20	20	20
Anaphalis busua	+		+	
Chamabainia cuspidata		+		
Cotoneaster acuminatus			+	
Euonymus tingens			1	0.3
Fragaria nubicola	+		+	
Galium hirtiflorum	+			
Elatostema obtusum		1		0.3
Gentiana	+			
Hydrocotyle nepalensis		+	+	
Pimpinella diversifolia			+	
Ranunculus diffusus	+			
Rubia cordifolia	+			
Rubus calycinus		+		
Sanicula elata		+		
Viola serpens	+		+	
Carex brunnea	+			
C. cruciata	1	+		0.3
Oplismenus compositus			+	

Table 31. Floristic Composition of *Rhodondendron arboreum* Forest (Plot No. 69).

Canopy Plot No. & Quadrat No.(10m x 10m)	69–164
1st Layer	
Height m	11
Number of Species	4
Coverage %	60
Rhododendron arboreum	6
Lyonia ovalifolia	+
Quercus glauca	+
Q. semecarpifolia	+
Shrub Layer	
Height m	0.5~1.5
Number of Species	23
Coverage %	60
Caryopteris foetida	+
Cuscuta reflexa	+
Dipsacus atratus	+
Gaultheria fragrantissima	1
Jasminum disperum	+
Lyonia ovalifolia	+
Myrsine semiserrata	1
Strobilanthes atropurpureus	+
Astilbe rivularis	+
Berberis	+
Boenninghausenia albiflora	+
Daphne bholua	3
Eurya acuminata	2
Ilex dipyrena	+
Lindera pulcherrima	+
Quercus glauca	+
Q. lineata	+
Q. semecarpifolia	+
Zanthoxyllum oxyphyllum	+
Capillipedium assimile	1
Cautleya spicata	+
Smilax menispermoidea	+
Pteris cretica	+

Herb Layer Plot & Quadrat No.	69–164– 1	2	3	M	C
Height cm	0~ 30	0~ 30	0~ 30	0~ 30	
Number of Species	20	13	19	17	
Coverage %	95	90	80	88	
Ainsliaea latifolia	2		1	1.0	III
A. wallichii	+				
Dipsacus atratus		2	1	1.0	III
Gaultheria fragrantissima			1	0.3	II
Gentiana capitata	+		+		III
Lyonia ovalifolia		1		0.3	II
Myrsine semiserrata	+	1	+	0.3	V
Senecio wallichii	+				II
Strobilanthes atropurpureus	2	1		1.0	III
Tripterospermum volubile			+		II
Valeriana hardwickii	+		+		III
Viburnum mullaha			+		II
Anemone rivularis			3	1.0	II
Berberis			+		II
Boenninghausenia albiflora			+		II
Daphne bholua	+		+		III
Heracleum wallichianum		1		0.3	II
Holboellia latifolia	+				II
Pilea umbrosa	1			0.3	II
Pimpinella diversifolia		+	+		III
Quercus lineata		+			II
Sanicula elata	1	+	+	0.3	V
Schisandra propinqua		+			II
Tetrastigma serrulata	+				II
Viola serpens	+				II
Sarcococca	+				II
Capillipedium assimile	1	1		0.7	III
Carex cruciata	1		3	1.3	III
Cautleya spicata	+				II
Smilax menispermoidea		+			II
Dryopteris		2	1	1.0	III
Pteris quadriaurita	+		+		III
Selaginella	3			1.0	II
Thuidium	+	5	4	3.0	V
Bartramia			1	0.3	II
Plagiochila	+				II

Table 32. Floristic Composition of *Rhododendron arboreum* Forest (Plot No. 70).

Canopy Plot & Quadrat No.(10m x 10m)	70-165	70-166	M	C
1st Layer				
Height m	7~9	7~9	7~9	
Number of Species	3	3	3	
Coverage %	90	80	85	
Rhododendron arboreum	9	8	8.5	V
Lyonia ovalifolia	+	+		V
Quercus lanuginosa	1	1	1.0	V
Shrub Layer				
Height m	0.5 ~ 2.0	0.5~ 2.0	0.5~ 2.0	
Number of Species	29	22	26	
Coverage %	30	50	40	
Eupatorium adenophorum		+		III
Gaultheria fragrantissima	+	+		V
Inula cappa	+	+		V
Lyonia ovalifolia	+			III
Myrsine semiserrata	1	3	2.0	V
Randia tetrasperma	+	+		V
Scutellaria repens	+	+		V
Strobilanthes atropurpureus	+	+		V
Symplocos phyllocalyx	+	1	0.5	V
Viburnum coriaceum	+	+		V
V. erubescens	+			III
Wendlandia puberula	+			
Acer oblongum	+			III
Astilbe rivularis	+	+		V
Brassaiopsis mitis	+			III
Castanopsis tribuloides	+			III
Euonymus frigidus	+			III
Eurya acuminata	1		0.5	III
Ficus neriifolia	+			III
Glochidion velutinum		+		III
Lindera pulcherrima	+	+		V
Machilus duthiei	+	+		V
Michelia kisopa	+	+		V
Myrica esculenta	+	+		V
Pilea smilacifolia		+		III
Prunus cerasoides	+			III
Quercus lanuginosa	+	+		III
Q. lineata	+	+		V
Rhamnus virgatus		+		III
Tetrastigma serrulata		+		III
Arundinaria maling	2	2	2.0	V
Cautleya spicata	1	+	0.5	V
Smilax menispermoidea	+			
	+			
Polystichum squarrosum	+			III

Herb Layer Plot & Quadrat No.	70-165- 1	2	3	70-166- 1	2	3	M	C
Height cm	10~ 30	0~ 20	0~ 15	0~ 30	0~ 30	5~ 40	3~ 28	
Number of Species	5	8	5	11	12	8	8	
Coverage %	30	30	+	80	90	80	52	
Ainsliaea latifolia				2		5	1.2	II
Craniotome furcata		+		+	+			III
Eupatorium adenophorum				+				I
Galium hirtiflorum					+	+		II
Lysimachia debilis			+					I
Myrsine semiserrata		+	+					II
Ophiorrhiza prostrata				2	+	1	0.5	III
Rubia manjith				1			0.2	I
Scutellaria repens	+			1			0.2	II
Strobilanthes atropurpureus	3	+	+	1	+	3	1.2	V
Wendlandia puberula					+			I
Boenninghausenia albiflora		+				1	0.2	II
Desmodium tiliaefolium	+							I
Hedera nepalensis				+				I
Indigofera		+						I
Quercus lanuginosa				1			0.2	I
Tetrastigma serrulata						+		I
Viola serpens					+			I
Carex cruciata		+		3	5	+	1.3	III
Coelogyne corymbosa	+							I
Cymbidium elegans	1					1	0.3	II
Oplismenus compositus					+			I
Smilax menispermoidea					+			I
Polystichum squarrosum			1		+		0.2	II
Dryopteris splendens		+						I
Moss		3	+	2	4		1.5	III
Selaginella					+			

Table 33. Floristic Composition of *Rhododendron arboreum* Forest (Plot No. 92, 93 & 94).

Canopy Plot No. & Quadrat No. (10m x 10m)	92- 191	93- 192	94- 193	M	C
1st Layer					
Height m	6~8	7	8	7.5	
No. of Species	3	2	1	2	
Coverage %	50	90	30	57	
Lyonia ovalifolia	2	1		1	
Rhodondedron arboreum	5	9	3	5.7	
Viburnum stellatum	+				
2nd Layer					
Height m	1~3	3~5	3~4		
No. of Species	6	2	6	5	
Coverage %	50	10	90	50	
Camellia kissii			2	0.7	
Eupatorium adenophorum			+		
Eurya cerasifolia	1		1	0.7	
Machilus duthiei	1			0.3	
Mahonia napaulensis	+				
Maytenus rufa			+		
Myrsine semiserrata			+		
Rhododendron arboreum		+	5	1.7	
Sorbus hedlundi	1			0.3	
Symplocos pyrifolia		+			
Gaultheria fragrantissima	1			0.3	
Viburnum erubescens	3			1.0	
Shrub Layer					
Height m		1~0.5	1		
No. of Species		11	10	11	
Coverage %		5	70	38	
Camellia kissii			+		
Castanopsis tribuloides			+		
Daphne bholua		+	+		
Eupatorium adenophorum		+			
Eurya cerasifolia		+			
Ligustrum nepalense		+			
Lyonia ovalifolia			+		
Maytenus rufa			+		
Myrsine semiserrata			+		
Phyllanthus			+		
Quercus glauca		+			
Randia tetrasperma		+	4	1.3	
Rubus ellipticus			+		
Senecio triliguletus		1		0.3	
Sorbus hedlundi		+			
Symplocos pyrifolia		+	1	0.3	
Thalictrum reniforme		+			
Viburnum erubescens		+			

Herb Layer Quadrat No. (1m x 1m)	92-191- 1	2	3	93-192- 1	2	3	94-193- 1	2	3	M	C
Height cm	10~50			10~30			20~30			37	
No. of Species	14	18	11	16	15	9	9	8	5	12	
Coverage %	60			40			5			35	
Ainsliaea latifolia				+	+	1		+		0.1	II
Astilbe rivularis			+								I
Berberis asiatica				+	+						I
Craniotome longicaule		+	+		+	+		+			III
Daphne bholua	+										I
Elaeagnus				+							I
Ficus foveolata				+							I
Ellisiophyllum pinnatum	+	+	+								II
Euonymus					+						I
Eupatorium adenophorum		+		+	+		+				II
Gentiana capitata		+					+		+		II
Holboellia latifolia		+									I
Hedera nepalensis					+						I
Indigofera	+										I
Lysimachia debilis					+						I
Machilus duthiei		+		+							I
Mahonia	+	+	+								II
Maytenus rufa							+				I
Myrsine semiserrata		+		+	+						II
Phyllanthus								+			I
Randia tetrasperma				+		+	+	+	1	0.1	III
Rosa pellucida								+	+		I
Rubia cordifolia		+		+							I
Rubus ellipticus								+			I
Sarcococca hookeriana	+										I
Senecio trilligulatus		+									I
Strobilanthes atropurpureus	+	+	+	+	1	+				0.1	III
Symplocos ramosissima						+					I
S. pyrifolia					+						I
Viburnum erubescens	+						+				I
Viola serpens					+						I
Calanthe		+									I
Carex cruciata	+			+	+	+					II
Ophiopogon intermedius	+		+	+	+	1	+			0.1	III
Oplismenus compositus	+	+									I
Smilax menispermoidea	+			+			+				II
Athyrium macrocarpum		1								0.1	I
Dryopteris splendens	1	+	+							0.1	II
Peranema cyatheoides			+								I
Polystichum		+					1	1	+	0.2	II
Pteris quadriaurita	+	+	+	+	+		+	+	+		IV
Selaginella	2	2	1	1	1	+				0.6	III
Thelypteris esquirolii			1	1		+				0.2	II

Table 34. Floristic Composition of *Rhododendron arboreum* Forest (Plot No. 106).

Canopy Quadrat No.(10m x 10m)	106–205
1st Layer	
Height m	5~2
No. of Species	2
Coverage %	30
Quercus semecarpifolia	2
Rhododendron arboreum	2
Shrub Layer	
Height m	1
No. of Species	8
Coverage %	80
Berberis asiatica	+
Daphne bholua	+
Hypericum uralum	+
Lindera pulcherrima	+
Lyonia ovalifolia	+
Pieris formosa	7
Quercus semecarpifolia	1
Rhododendron arboreum	2

Herb Layer Quadrat No. (1m x 1m)	106–205–				
	1	2	3	M	C
Height cm	10~30			30	
No. of Species	7	4	8	6	
Coverage %	20	5	10	12	
Anaphalis contorta			+		II
A. triplinervis		+			II
Dipsacus atratus	+		+		III
Fragaria nubicola	+				II
Gentiana capitata	+		+		III
Hemipharagma heterophyllum			+		II
Lindera pulcherrima			+		II
Myriactis nepalensis	+	+			III
Pteris formosa	1	+		0.3	III
Pimpinella diversifolia			+		II
Arundinaria	+	+			III
Carex	1		+	0.3	III
Ophiopogon			+		II

Table 35. Floristic Composition of *Rhododendron arboreum* Forest (Plot No. 107).

Canopy Plot & Quadrat No.(10m x 10m)	107–206
1st Layer	
Height m	6~8
No. of Species	4
Coverage %	70
Lyonia ovalifolia	1
Quercus semecarpifolia	1
Rhododendron arboreum	5
Symplocos pyrifolia	2
2nd Layer	
Height m	2~4
No. of Species	5
Coverage %	20
Eurya acuminata	+
Lindera pulcherrima	+
Rhododendron arboreum	+
Symplocos ramosissima	1
S. pyrifolia	+
Shrub Layer	
Height m	0.5~1
No. of Species	9
Coverage %	40
Daphne bholua	1
Edgeworthia gardneri	1
Eurya acuminata	+
Ilex dipyrena	+
Lindera pulcherrima	1
Pieris formosa	1
Quercus semecarpifolia	+
Symplocos ramosissima	1
S. pyrifolia	+

Herb Layer Quadrat No. (1m x 1m)	107–206–				
	1	2	3	M	C
Height cm	10~20			20	
No. of Species	7	8	9	8	
Coverage %	20	25	20	22	
Anaphalis triplinervis		1	1	0.7	III
Eurya acuminata	+		+		III
Fragaria nubicola		+	+		III
Gentiana capitellata		+			II
Gentiana		+	+		III
Holboellia latifolia		+	+		III
Pimpinella diversifolia	+		+		II
Rubus paniculatus		+			II
Rubus	+		+		III
Symplocos ramosissima	+				II
Carex	+	1	1	0.7	V
Ophiopogon	+				II
Smilax menispermoidea	+				II
S. rigida		+	+		III

Table 36. Floristic Composition of *Quercus lanuginosa* Forest (Plot No. 5 & 7)

Canopy Plot & Quadrat No. (10m x 10m)	5- 17	18	19	20	7- 22	M	C
1st Layer							
Height m	11	10	10	10	11	10	
Number of Species	2	2	2	1	1	2	
Coverage %	60	50	65	45	70	57	
Lyonia ovalifolia		+	+				II
Quercus lanuginosa	7	5	7	5	7	6.2	V
Rhododendron arboreum	+						I
2nd Layer							
Height m	5~ 4		6~ 5	8~ 5		6~ 5	
Number of Species	1	0		1	0	1	
Coverage %	+	0	+	+	0	+	
Lyonia ovalifolia	+		+				II
Myrica esculenta			1			0.2	I
Rhododendron arboreum				+			I
Shrub Layer							
Height m	1.5~ 0.5	1.5~ 1	1	1	1.5	1.3	
Number of Species	17	19	16	18	7	15	
Coverage %	40	20	20	25	+	21	
Berberis asiatica	+	+	+	+	+		V
Buddleja paniculata			+				I
Caryopteris grata	+	+	+	+			IV
Castanopsis tribuloides	+	+	+				III
Desmodium floribundum	+	+	+	1	+	0.2	V
Elsholtzia blanda		+					I
Gaultheria fragrantissima	1	+	+	+	+	0.2	V
Inula cappa	1	+	1	1	1	0.8	V
Ligustrum nepalense	+						I
Lyonia ovalifolia	+	+	+	+	+		V
Myrica esculenta		+		+			II
Myrsine semiserrata	+		+				II
Hypericum uralum	+	+	+	1		0.2	IV
Phoebe lanceolata				+			I
Phyllanthus parvifolius	+	+		+			III
Prunus cerasoides		+		+			II
Randia tetrasperma	+		+				II
Rhododendron arboreum	+	+	+	+			IV
Rubus ellipticus	+	+	+	+	+		V
R. foliolosus				+			I
Sarcococca coriacea	+						I
Schima wallichii		+	+	+			III
Symplocos theaefolia		+		+			II
Wendlandia coriacea		+					I
W. puberula	+						I
Arundinaria falcata			+				I
Smilax menispermoidea		+		+			II
Polystichum aculeatum	+	+	+	+	+		V

Herb Layer Plot & Quadrat Number (1m x 1m)	5-17- 1	2	3	5-18- 1	2	3	5-19- 1	2	3	5-20- 1	2	3	7-22- 1	2	3	M	C
Height cm	15~ 10	40~ 10	50~ 10	30~ 10	50~ 10	30~ 10	30~ 10	40~ 10	30~ 10	25~ 10	30~ 10	50~ 10	30~ 10	20~ 10	20~ 5	33~ 10	
Number of Species	11	15	11	10	14	12	12	11	11	12	12	11	5	5	7	11	
Coverage %	50	40	50	20	25	25	20	30	60	20	15	30	60	30	40	34	
Ainsliaea latifolia	+					+	+	+	+	+	+	+					III
Anaphalis contorta		+	+							1	+	1	+	+	+	0.1	III
A. triplinervis	+	+	+	+	+	+	+	+	+	+	+						IV
Berberis asiatica										+							
Caryopteris grata	+											+					I
Bupleurum tenuifolium					+												
Castanopsis tribuloides							+										
Conyza hieracifolia															+		
Craniotome versicolor									+								
Desmodium floribundum	+	+	1	1	+	+	+		+	+	1	1				0.3	IV
Desmodium													+		+		I
Elsholtzia blanda															+		
Galium hirtiflorum	+	+	+	+		+		+	+	+							III
Gaultheria fragrantissima						1										0.1	
Gynura nepalensis				+													
Hydrocotyle javanica							+										
Indigofera hebepetala						+											
Inula cappa					+						+						I
Justicia procumbens								+	+						+		I
Ligustrum nepalense											+						
Lysimachia alternifolia			+														
Myriactis nepalensis		+	+				+		+					+			II
Myrica esculenta	+				+						+						I
Hypericum uralum	+				+	+											I
Phoebe lanceolata										+							
Phyllanthus parvifolius		+		+	+			+		+		1				0.1	II
Prunus cerasoides											+						
Quercus lanuginosa	+	+						+				+		+			II
Randia tetrasperma		+															
Rhododendron arboreum		+					+										I
Scrophularia urticaefolia		+				1										0.1	I
Strobilanthes atropurpureus	+	+	+	+	+	+	2	+	+	+	+					0.1	IV
Viola serpens							+					+	+				I
Calamintha longicaulis					+		+	+		+	+	+					II
Unidentified									+								
Arundinella nepalensis	3		1								+		5	3	1	0.9	II
Capillipedium assimile		+			1	+		1								0.1	I
Carex cruciata	+	1	1			2	+	2	1	+						0.5	III
C. longipes		+	+	+	+					+	1					0.1	II
Chrysopogon gryllus													1	1	3	0.3	I
Ophiopogon intermedia								+	+								I
Ophiopogon				+			+										I
Pogonatherum paniceum												1				0.1	
Cheilanthes albomarginata			+	+	+	+						+					II
Polystichum aculeatum		+		+	1							1				0.1	I
Selaginella monospora					1											0.1	

Table 37. Floristic Composition of *Quercus lanuginosa* Forest (Plot No. 66).

Canopy Plot & Quadrat No. (10m x 10m)	66–159	66–160	M	C
1st Layer				
Height m	16	16	16	
Number of Species	2	1	2	
Coverage %	50	40	55	
Quercus lanuginosa	5	4	4.5	V
Q. lineata	+			III
2nd Layer				
Height m	5~7	5~8	5~8	
Number of Species	4	7	6	
Coverage %	50	75	63	
Lyonia ovalifolia	3	+	1.5	V
Rhododendron arboreum		3	1.5	III
Castanopsis tribuloides	1	2	1.5	V
Indigofera dosua	+			III
Litsea oblonga		+		III
Quercus glauca		4	2.0	III
Q. lanuginosa	2		1.0	III
Q. lineata		+		III
Schima wallichii		+		III
Shrub Layer				
Height m	0.5~2	1~2	0.8~2	
Number of Species	18	14	17	
Coverage %	70	+	35	
Adina tetrasperma		+		III
Caryopteris foetida		+		III
Inula cappa	+	+		V
Isodon coetsa	+			III
Lyonia ovalifolia	+			III
Myrsine semiserrata	+	+		V
Rhododendron arboreum	+			III
Viburnum coriaceum	+	+		V
Wendlandia tinctoria		+		III
Caesalpinia sepiaria	+			III
Castanopsis tribuloides	2	+	1.0	V
Desmodium tiliaefolium	+			III
Ficus nemoralis	+			III
Indigofera dosua	2	+	1.0	V
Lespedeza eriocarpa	+			III
Myrica esculenta	+			III
Prunus cerasoides		+		III
Quercus glauca		+		III
Q. lanuginosa		+		III
Q. lineata	+	+		V
Rubus ellipticus	+			III
Spiraea bella		+		III
Arundinaria maling	3		1.5	III
Cautleya spicata	+			III
Miscanthus nepalensis	+			III
Smilax menispermoidea		+		III

Herb Layer Plot & Quadrat No. (1m x 1m)	66–159– –1	 –2	 –3	66–160– –1	 –2	 –3	M	C
Height cm	5~25	5~30	0~20	5~15	5~30	5~20	4~23	
Number of Species	5	9	6	5	7	4	6	
Coverage %	40	50	75	55	40	30	48	
Adina tetrasperma		+						I
Ainsliaea latifolia	3	3	6	5	2	2	3.5	V
Clinopodium longicaule		+						I
Eupatorium adenophorum		+						I
Isodon coetsa	1			+			0.2	II
Galium hirtellum	+	+		+				III
Myrsine semiserrata			1	+	+	+	0.2	III
Rubia manjith			+					I
Strobilanthes atropurpureus			+					I
Cramiotome			1				0.2	I
Boenninghausenia albiflora		+						I
Cochlianthus gracilis	+	+			+			III
Desmodium tiliaefolium	1		+		+		0.2	III
Ficus neriifolia					1		0.2	I
Quercus lineata		+						I
Tetrastigma serrulata					+			I
Carex finitima		1			2	1	0.7	III
Oplismenus compositus				+		+		II

Table 38. Floristic Composition of *Quercus lanuginosa* Forest (Plot No. 95, 96 & 97).

Canopy Plot & Quadrat No.(10m x 10m)	95–194	96–195	97–196	M	C
1st Layer					
Height m	17	18	12	16	
No. of Species	3	3	1	2.3	
Coverage %	70	60	60	6.3	
Quercus lanuginosa	6	5	6	5.7	V
Rhododendron arboreum	2	2		1.3	III
Schima wallichii	+	1		0.3	III
2nd Layer					
Height m	6~8	4~7	4~8		
No. of Species	1	1	1	1	
Coverage %	5	40	75	40	
Rhododendron arboreum	+		8	2.7	III
Schima wallichii		+			II
Shrub Layer					
Height m	0.5~1	1~1.5	1	1.2	
No. of Species	4	5	3	4	
Coverage %	60	15	40	38	
Berberis asiatica	+	+	+		V
Elsholzia		+			II
Eupatorium adenophorum	6	1	4	3.7	V
Randia tetrasperma	1	1	+	0.7	V
Schima wallichii	+	1		0.3	III

Herb Layer Quadrat No. (1m x 1m)	95–194–			96–195–			97–196–				
	1	2	3	1	2	3	1	2	3	M	C
Height cm	20~30			30			20			27	
No. of Species	5	6	5	7	4	6	8	9	7	6	
Coverage %	10			+			5			5	
Ainsliaea latifolia	+		+				+	+	+		III
Anaphalis busua				+			+	+			II
Berberis asiatica	+			+	+		+	+			III
Elsholzia		+	+	+		+					II
Eupatorium adenophorum	+	+	+	+	+		+	+	+		IV
Ficus neriifolia								+			I
Gentiana			+								I
Phyllanthus				+				+			I
Prunus cerasoides		+									I
Quercus lanuginosa						+					I
Randia tetrasperma	+	+		+	+	+	+	+	+		IV
Rubia cordifolia			+			+					I
Schima wallichii		+		+				+			II
Viola serpens						+	+				I
Carex cruciata							+		+		I
Roscoea purpurea									+		I
Polystichum					+				+		I
Selaginella	+	+				+	2	1	2	0.6	III

Table 39. Floristic Composition of *Abies* Forest (Plot No. 30 & 31).

Canopy Plot & Quadrat No. (10m x 10m)	30–65	31–66	M
1st Layer			
Height m	22	23	23
No. of Species	1	1	1
Coverage %	10	30	20
Abies spectabilis	1	3	2
2nd Layer			
Height m	10~7	14	12
No. of Species	4	3	4
Coverage %	75	80	78
Cotoneaster acuminatus	+		
Kalopanax 2359		1	0.5
Lonicera acuminata	+		
Rhododendron arboreum var. *campbelliae*	8	8	8
Sorbus maddeni		1	0.5
Smilax glaucophylla	+		
Shrub Layer			
Height m	5~2	3	4
No. of Species	3	3	3
Coverage %	30	30	30
Cotoneaster acuminatus	+	+	
Lonicera acuminata		+	
Arundinaria hookeriana	3	3	3
Smilax glaucophylla	+		

Herb Layer Quadrat No. (1m x 1m)	30–65–			31–66–				
	1	2	3	1	2	3	M	C
Height cm	30~15	10~5	15~10	20	20	20		
No. of species	3	4	6	2	4	3	3.7	
Coverage %	+	+	15	10	20	+	7.5	
Euonymus tingens						+		I
Ilex dipyrena						+		I
Impatiens	+							I
Jasminum humile					+			I
Panax pseudo-ginseng			+					I
Senecio alatus		+						I
Sorbus maddeni						+		I
Carex	+		2				0.3	II
Carex 2355					2		0.3	I
Ophiopogon clarkei					+			I
O. intermedius			+					I
Ophiopogon				1			0.2	I
Smilacina purpurea				+				I
Smilax glaucophylla	+	+						II
Fern *2350*		+			+			II
Leptodontium squarrosum			+					I
Plagiothecium curvifolium		+	+					II
Thuidium cymbifolium			+					I

able 40. Floristic Composition of *Abies* Forest (Plot No. 54 & 56).

nopy ot & uadrat No. (10m x 10m)	54– 115	116	117	118	119	120	56– 122	123	124	M	C
t Layer											
eight m	46						35			42	
o. of Species	1	1	1	1	1	1	1	1	1	1	
overage %	80	75	50	70	40	60	60	15	20	52	
bies spectabilis	8	8	5	7	4	6	6	2	2	5.3	V
d Layer											
eight m	10~5						10~3			10	
o. of Species	2	3	2	3	2	1	2	1	3	2	
overage %	60	50	70	95	95	90	40	40	60	67	
ematis montana									+		I
niperus recurva							1		3	0.4	I
ododendron arboreum var. *campbelliae*	5	3	2	+	3		4	4	4	2.8	IV
ododendron barbatum	3	4	6	10	8	9				4.4	III
burnum erubescens		+		+							I
rub Layer											
eight m	1.5~1						1.5~0.5			1.5	
o. of Species	4	2	2	2	3	1	2	4	3	3	
overage %	15	15	10	+	20	5	5	20	+	10	
rberis aristata				+	+			1		0.1	II
phne bholua	1	1	1	+	2	1	1	1	+	0.9	V
x dipyrena	+										
ododendron arboreum var. *campbelliae*								+	+		I
ododendron barbatum	+	1								0.1	I
burnum erubescens	+		+		+		+	+	+		III

Herb Layer Quadrat No. (1m x 1m)	54–115– 1	2	3	54–116– 1	2
Height cm	10			10	
No. of Species	14	12	14	11	18
Coverage %	70	75	60	95	60
Acronema tenerum					
Ainsliaea aptera					
Ainsliaea wallichii			+		
Ajuga lobata					
Berberis aristata			+		
Chrysosplenium nepalense				+	+
Circaea alpina	+	+	+		
Clematis montana					
Corydalis					
Daphne bholua	+		+		+
Elatostema obtusa	3		+	9	4
Fragaria nubicola	+				
Galium asperuloides					+
Hackelia uncinata		+		1	+
Hydrocotyle nepalensis				+	
Geranium polyanthes					
Impatiens					
Koenigia nepalensis					+
Parocetus communis					
Peracarpa carnosa					
Pilea subalpina	+	+	+	+	+
Pimpinella diversifolia			+		+
Polygonum chinense				+	+
Polygonum molle					
Primula petiolaris	+	2	1	+	+
Prunella vulgaris					
Ranunculus diffusus					
Rubia cordifolia	+				
Rubus calycina			2		
Salvia	+	+			+
Sanicula elata					+
Senecio					
Stellaria monosperma				1	+
Stellaria patens					
Strobilanthes atropurpureus	2	3	+	1	1
Thalictrum					
Triplostegia glandulifera	+	+			
Valeriana wallichii					
Viola biflora	+	+			
Umbelliferae	+			+	
Carex cruciata	+	3	3	+	+
Ophiopogon clarkei					
Oreorchis foliosa					
Poa 2970					+
Abies spectabilis					
Athyrium					
Polystichum obliquum					
Polystichum 2973					
Bartramia ithyphylla		1			
Bryum					
Pohlia cruda		2			
Symbrepharis vaginata			+		
Thuidium		1	1		1
Actinothuidium	1		+		+
Moss *2974*					
Moss *2970*					

	54-117-			54-118-			54-119-			54-120-			56-122-			56-123			56-124-				
3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	M	C
9 60	10 9 60	7 50	8 40	10 12 95	13 90	1~0 9 40	10 10 90	13 70	7 50	10 5 50	10 60	11 60	10 12 70	10 90	12 70	10 14 95	16 100	20 12 75	15 13 60	20 13 60	15 13 80	12 11 69	
																				+	+		
											+												
				+		+	+				+	+						1					I
															2			+	3	1	1	0.3	I
					+		+													+			I
							+									+	+						I
+						+		+			+												I
																	+	+					
																	+						
+									+					+	+		+						I
3	3	3	2	8	7	+	8	5	2	1	+	+	4	9	6	2	4	+	1	1	5	3.3	V
					+								+		+	+				+			I
		+	+											+	+				+		+		I
+								+					+	+	1	+	+		1	+	+	0.1	II
					1										+								
																			+				
																				+			
		+			+																		
2	1		1	+	+	+	1	+	+	+	1	+	+	+	+			+	+	+	1	0.3	IV
								+										+					I
								+	+														I
				+	+	+									+		+	+	+	+	+		II
1			+	+				+				+	1	1		1	1	+				0.3	III
																3						0.1	
	+												+				+						I
												+											
	2	+					1	2		1	+		1	1	1	2	3	6	3	2	+	1.0	III
								+					+			+	+		+	+	+		II
																			+	+			
+		1	1	+				+		+	+	+										0.1	II
																+							
	2	2			+							2				3						0.6	II
				+																			
						+						2	+									0.1	I
																			+				
																	+						I
				+																			I
	1	1	+	3	+	3	+	1	3	5	5	1	+	1	+	1	1	3		5	4	1.6	V
					+							+									+		I
	+																						
								+					+	+	+	+	+						I
																		+					
					+																		
+																							
			+																				
				+																			
																					+		
																						0.1	
1	1		2	1	+	1	+	+	1		+	+	1	+		3	1		+			0.6	IV
	+			1	1	+	+		+		+			+		+	3	4				0.4	III
							+																
																					+		

Table 41. Floristic Composition of *Abies* Forest (Plot No. 60).

Canopy Plot & Quadrat No. (10m x 10m)	60–131	132	133	M	C
1st Layer					
Height m		23	23	23	
No. of Species	0	1	1	1	
Coverage %	0	15	30	15	
Abies spectabilis		2	3	1.7	III
2nd Layer					
Height m	13.5	15	15	14.5	
No. of Species	2	1	1	1	
Coverage %	90	70	50	70	
Rhododendron arboreum var. *campbelliae*	9	7	5	7.0	V
Juniperus recurva	1			0.3	II
Shrub Layer					
Height m	1	1.5~1	1.5~1		
No. of Species	2	2	1	2	
Coverage %	+	15	20	12	
Berberis aristata	+				II
Daphne bholua	+	1	2	1.0	V
Viburnum erubescens		+			II

Herb Layer Quadrat No. (1m x 1m)	60–131– 1	2	3	60–132– 1	2	3	60–133– 1	2	3	M	C
Height cm	20	20	10	5	20	5	5	5	5	11	
No. of Species	10	10	8	11	7	8	12	8	11	9	
Coverage %	80	85	70	70	75	60	90	80	90	78	
Senecio Wallichii	+	+	+								II
Anemone rivularis		+									I
Berberis aristata	+										I
Circaea alpina		+									I
Clematis montana					+			+			I
Cotoneaster acuminatus		+									I
Elatostema obtusa	4	5	4	5	6	5	4	1	2	4.0	V
Daphne bholua	+		+				+		+		II
Fragaria nubicola							+				I
Hackelia uncinata				+	+		+	+			II
Koenigia nepalense				+		+					I
Pilea subalpina		1	+	+	+	+	+		+	0.1	IV
Pimpinella diversifolia				+			+		+		II
Polygonum campanulatum					+						I
Primula petiolata	+		+	+	+	+	+	+	+		IV
Rubia cordifolia	+	+	+								II
Rubus calycina				1		+	4	6	4	1.7	III
Salvia								+			I
Stellaria patens									+		I
Strobilanthes nutans	1	+							+	0.1	II
Viola biflora				+		+	+				II
Carex	3	1	2	+	2	1	+	1	1	1.2	V
Polystichum 4606				+							I
Actinothuidium	1						+		5	0.7	II
Thuidium	2	6	2	2		+	2	+	5	2.1	IV

Table 42. Floristic Composition of *Abies* Forest (Plot No. 111).

Canopy Quadrat No. (10m x 10m)	111–210	111–211	M
1st Layer			
Height m	40	35	38
No. of Species	1	1	1
Coverage %	25	75	50
Abies spectabilis	3	8	5.5
2nd Layer			
Height m	10	10~5	
No. of Species	1	3	2
Coverage %	70	80	75
Juniperus	7	4	5.5
Rhododendron barbatum		1	0.5
R. arboreum var. *campbelliae*		4	2.0
3rd Layer			
Height m	2~3		
No. of Species	2		
Coverage %	10		
Rhododendron barbatum	1		
R. campanulatum	1		
Shrub Layer			
Height m	1	1	1
No. of Species	5	4	5
Coverage %	15	5	10
Ainsliaea		+	
Berberis aristata	+	+	
Daphne bholua	1	+	0.5
Rhododendron arboreum var. *campbelliae*	+		
R. barbatum	+	+	
R. campanulatum	+		

Herb Layer Quadrat No. (1m x 1m)	111–210– 1	2	3	111–211– 1	2	3	M	C
Height cm	5~10			5~10			5~10	
No. of Species	6	4	10	7	5	2	6	
Coverage %	100	100	100	30	60	40	72	
Arabis			+					I
Berberis aristata		+	+					II
Daphne bholua			1		+		0.2	II
Elatostema obtusa			+					II
Fragaria nubicola			+	+				II
Gypsophila cerastioides					+			I
Hemiphragma heterophyllum			+					I
Polygonum molle				+	+	+		III
Primula petiolata	1			1			0.3	II
Rubus fockeana					+			I
Senecio graciliflorus					3	+	0.5	II
Umbelliferae				+				I
Valeriana wallichii			+					I
Carex	2	1	2				0.8	III
Luzura 0990	1		1				0.3	II
Abies spectabilis	+							I
Juniperus	+							I
Lycopodium		+						I
Actinothuidium hookeri	10	9	9	+			4.7	III
Ptychomitrium tortulum				+				I
Thuidium cymbifolium				1			0.2	I

Table 43. Floristic Composition of *Abies* Forest (Plot No. 112).

Canopy Plot & Quadrat No. (10m x 10m)	112–212
1st Layer	
Height m	40
No. of Species	1
Coverage %	15
Abies spectabilis	2
2nd Layer	
Height m	10~12
No. of Species	2
Coverage %	90
Rhododendron arboreum var. *campbelliae*	7
R. barbatum	3
Shrub Layer	
Height m	1~1.5
No. of Species	2
Coverage %	10
Berberis aristata	+
Daphne bholua	1

Herb Layer Quadrat No. (1m x 1m)	112–212– 1	2	3	M	C
Height cm	3~10			3~10	
No. of Species	6	5	8	6	
Coverage %	70	50	80	67	
Daphne bholua	+	+			III
Elatostema obtusa	+	2	1	1.0	V
Fragaria nubicola			+		II
Prinula petiolata	+	1	5	2.0	V
Ranunculus			1	0.3	II
Rubus fockeana	+	+	+		V
Carex	7	4	+	3.7	V
Poa			1	0.3	II
Ptychomitrium tortulum			3	1.0	II
Thuidium cymbifolium	+				II

Table 44. Floristic Composition of *Abies* Forest (Plot No. 117 & 118).

Canopy Plot & Quadrat No. (10m x 10m)	117–217	118–218	M
1st Layer			
Height m	15~18	25	22
No. of Species	1	1	1
Coverage %	60	50	55
Abies spectabilis	6	5	5.5
2nd Layer			
Height m	2~7	7	7
No. of Species	3	2	3
Coverage %	60	+	30
Rhododendron arboreum var. *campbelliae*	5	+	2.5
R. barbatum	1		0.5
Viburnum erubescens	1		0.5
Shrub Layer			
Height m	0.5~1	0.5~2	1.5
No. of Species	9	5	7
Coverage %	30	60	45
Berberis aristata	+	+	
Clematis montana	+		
Cotoneaster acuminatus	+		
Daphne bholua	+		
Euonymus echinatus	+		
Rhododendron arboreum var. *campbelliae*	2	6	4.0
Rosa sericea	+	+	
Spiraea bella	+	+	
Viburnum erubescens	+	+	

Herb Layer Quadrat No. (1m x 1m)	117–217– 1	2	3	118–218– 1	2	3	M	C
Height cm	5~50	5~15	5~30	5~20	5~30	5~50	5~32.5	
No. of Species	8	4	10	8	12	8	8	
Coverage %	100	100	70	95	80	70	86	
Ainsliaea latifolia	+		+		+	+		III
A. aptera			2	+		+	0.3	III
Anaphalis margaritacea			+					I
Anemone obtusiloba				+				I
Clematis montana					+			I
Cotoneaster acuminatus						+		I
Daphne bholua	+				+			II
Fragaria nubicola			+	+				II
Gaultheria nummuralioides	4	+	+	1		+	1.0	IV
Geranium nepalense			+					I
Myriactis nepalensis			+					I
Umbelliferae *1723*					+	+		II
Ribes 1725					+			I
Rubus fockeana	2	3	3	+	1		1.5	IV
Sanicula elata					+			I
Spiraea bella	+				+			II
Strobilanthes 1726					+	+		II
Viburnum erubescens			+					I
Carex longipes	4	9	6	3	3	4	4.8	V
Ophiopogon				2			0.3	I
Polygonatum	+							I
Dryopteris wallichiana					+			I
Thuidium cymbifolium	9	7		9	4	6	5.8	IV

Table 45. Floristic Composition of *Tsuga* Forest (Plot No. 32).

Canopy Plot & Quadrat No. (10m x 10m)	32– 67	68	69	70	71	72	M	C
1st Layer								
Height m	40	40	40	40	40	40	40	
No. of Species	1	2	1	2	1	1	1	
Coverage %	80	90	90	50	70	100	80	
Abies spectabilis		2		1	7		1.7	III
Tsuga dumosa	8	7	9	5		10	6.5	IV
2nd Layer								
Height m	15	15	15	15	15	15	15	
No. of Species	1	2	1	1	1	2	1	
Coverage %	10	20	15	50	40	50	31	
Ilex dipyrena	1	2	2	5	4	5	3.2	V
Osmanthus fragrans		1				1	0.3	II
3rd Layer								
Height m	4~3		3~2	3~2	3~2	3~2	3	
No. of Species	2	0	2	2	2	3	2	
Coverage %	10	0	+	+	+	1	1.8	
Berberis aristata	+							I
Arundinaria hookeri			+	+	+	+		III
Ilex dipyrena			+		+	1	0.2	III
Pieris formosa	1			+			0.2	II
Rhododendron arboreum var. *campbelliae*						+		I
Shrub Layer								
Height m	1~ 0.5	1~ 0.5	1~ 0.5	1~ 0.5	1~ 0.5		1~ 0.5	
No. of Species	2	1	1	1	2		1	
Coverage %	10	40	5	10	+		10	
Arundinaria hookeriana					+			I
Berberis aristata	+							I
Pieris formosa	1	4	1	1			1.2	III
Polystichum wallichii					+			I

Herb Layer Quadrat No. (1m x 1m)	32–67–			32–68–			32–69–			32–70–			32–71–			32–72–				
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	M	C
Height cm	40	30	30	25	25	30	40	40	20	30	15	20	30	40	30	25	15	15	27	
No. of Species	17	11	14	14	10	8	10	7	9	10	8	12	12	13	8	5	6	11	10	
Coverage %	95	70	80	80	90	75	80	80	70	80	90	70	85	80	80	80	90	75	80	
Achyranthes bidentata	2	2	+	1	3	1			5	5						8			1.5	III
Ainsliaea latifolia																	+			
Ainsliaea aptera	+	+	1	+	+	1	+		+								+	1	0.2	III
Berberis aristata								+												
Carpesium 2361	+						1		1	+		+	1	1	1			+	0.3	III
Circaea alpina	+	1	+	+			+				+	1	1	+	+			+	0.2	III
Elatostema obtusa	+	+	+	+	1					1	1	1	+				+	+	0.2	III
Galium hirtiflorum														+		+				I
Hedera nepalensis			1	+								+							0.1	I
Ilex dipyrena													+		6				0.3	I
Impatiens						+				1									0.1	I
Peracarpa carnosa	+		+		+					+	+					+		+		II
Pieris formosa									+											
Pilea 2559	+	+		+	1			+											0.1	I
Polygonum microcephalum											+	+		+	+	+		+		II
Primula petiolaris	+									1			+	+					0.1	I
Rubia cordifolia	+																			
Sanicula elata				+																
Strobilanthes atropurpureus	6	1	2	2		5	1	5	2		6	4	1	5			9	6	3.1	IV
Swertia	+																			
Tripterospermum volubile	+			1	+			+											0.1	I
Arisaema utile											+			+						I
Arundinaria hookeriana									+											
Capillipedium compositum		+	+						+				+	+						I
Carex 2355	1	+	1	2	3		2		+		2	2	2	2	2		+		1.1	IV
Ophiopogon clarkei	+			+	+							+		+						I
Athyrium 2362	1	+	1				4	5	+		+	1	2	+	+			+	0.8	III
Polypodium			+	+		+												+		I
Polystichum wallichii	1					+	2	1		2		1	1						0.4	II
Plagiochila		4	3	2	2	+	+			+					2			1	0.8	III
Rhodobryum?		+	+				+			+		+	+	+				+		II
Thuidium	3		4	5	1	+	+	1		2		+	6	4	3	+	+		1.6	IV

Table 46. Floristic Composition of *Juniperus* Forest (Plot No. 55).

Canopy Plot & Quadrat No. (10m x 10m)	55–121
1st Layer	
Height m	5~10
No. of Species	1
Coverage %	90
Juniperus recurva	9

Herb Layer Plot & Quadrat No. (1m x 1m)	55–121– 1	2	3	M
Height cm	0~5			5
No. of Species	13	14	14	14
Coverage %	100	100	100	100
Angelica		+		
Elatostema obtusa		3	5	2.7
Chrysosplenium nepalense	3			1.0
Fragaria nubicola	+	1	3	1.3
Galium acutum	+			
Hackelia uncinata		+	+	
Pilea subalpina		+	+	
Pimpinella diversifolia			+	
Primula petiolaris	+			
Prunella vulgaris	4	+	+	1.3
Ranunculus	+	+	+	
Stellaria patens	+	+	+	
Strobilanthes atropurpureus	4	3	3	3.3
Viola biflora		3	5	2.7
Carex cruciata	+	+	3	1.0
Carex	+			
Poa	+	+	+	
Actinothuidium	+	7	5	4.0
Thuidium cymbifolium	5	2	3	3.3

Table 47. Floristic Composition of *Juniperus* Forest (Plot No. 115).

Canopy Plot & Quadrat No. (10m x 10m)	115–215
1st Layer	
Height m	15
No. of Species	2
Coverage %	95
Juniperus recurva	10
Rhododendron arboreum var. *campbelliae*	1

Herb Layer Quadrat No. (1m x 1m)	115–215– 1	2	3	M	C
Height cm	5			5	
No. of Species	9	7	11	9	
Coverage %	60	40	80	60	
Corydalis			+		II
Elatostema obtusa	+				II
Galium hirtiflorum	+	1	+	0.3	V
Myriactis nepalensis			+		II
Primula petiolata	1	2	1	1.3	V
Phlomis			+		II
Ranunculus	+	+	+		V
Valeriana wallichii	+	+	+		V
Poa	1	1	1	1.0	V
Actinothuidium hookeri	1			0.3	II
Bartramia			+		II
Campylopus			+		II
Conocephalum?		+			II
Plagiochila grollei	+	+			III
Thuidium cymbifolium	5		7	4.0	III

Table 48. Floristic Composition of *Rhododendron arboreum* var. *campbelliae* Forest (Plot No. 100, 101 & 102).

Canopy Plot & Quadrat No. (10m x 10m)	100– 199	101– 200	102– 201	M	C
1st Layer					
Height m	5	2~5	5	5	
No. of Species	1	4	1	3	
Coverage %	100	100	100	100	
Berberis		+			
Clematis montana		+			
Rhododendron arboreum var. *campbelliae*	10	10	10	10	
Rosa sericea		+			

Herb Layer Quadrat No. (1m x 1m)	100–199– 1	2	3	101–200– 1	2	3	102–201– 1	2	3	M	C
Height cm	10			10			20~30			17	
No. of Species	1	3	4	4	4	4	2	3	6	3	
Coverage %	5			30			20			18	
Anaphalis contorta				+					+		I
Anemone rivularis			+					+			I
Berberis			+			1				0.1	I
Daphne bholua				+		+	+		+		II
Gaultheria nummuralioides						+					I
Geranium lambertii					+						I
Hemiphragma heterophyllum									+		I
Holboellia latifolia		+			+						II
Myriactis nepalensis		+	+	+	+				+		III
Potentilla									+		I
Rhododendron arboreum var. *campbelliae*								+			I
Carex cruciata	+	2	1	5	2	1	2	2	1	1.8	V

Table 49. Floristic Composition of *Rhododendron arboreum* var. *campbelliae* Forest (Plot No. 108, 109, & 110).

Canopy Plot & Quadrat No. (10m x 10m)	108– 207	109– 208	110– 209	M
1st Layer				
Height m	8~10	10~13	7~10	10
No. of Species	2	2	2	2
Coverage %	80	30	50	53
Lyonia ovalifolia	2		3	1.7
Quercus semecarpifolia		1		0.3
Rhododendron arboreum var. *campbelliae*	5	3	2	3.3
2nd Layer				
Height m	1~3	2~5	2~4	
No. of Species	10	5	4	6.3
Coverage %	50	50	30	43
Berberis aristata	+			
Dodecadenia grandiflora		+		
Edgeworthia gardneri	1			0.3
Ilex dipyrena	+			
Ligustrum	+			
Lindera pulcherrima	+			
Lyonia ovalifolia	+	+		
Pieris formosa			1	0.3
Quercus semecarpifolia	+	1	+	0.3
Rhododendron arboreum var. *campbelliae*	1	3	3	2.3
Sarcococca	+			
Symplocos ramosissima	4		2	2.0
S. theaefolia		+		
Shrub Layer				
Height m		0.5~1	1	1
No. of Species	0	6	11	9
Coverage %	0	30	50	40
Berberis aristata			1	0.5
Dodecadenia grandiflora		+	+	
Edgeworthia gardneri			+	
Eurya acuminata		+	+	
Lindera pulcherrima			+	
Lyonia ovalifolia		+		
Pieris formosa			+	
Quercus semecarpifolia		+	+	
Rhododendron arboreum var. *campbelliae*		1	2	1.5
Skimmia			+	
Symplocos ramosissima			4	2.0
S. theaefolia		2		1.0
Smilax rigida			+	

Herb Layer Quadrat No. (1m x 1m)	108–207– 1	2	3	109–208– 1	2	3	110–209– 1	2	3	M	C
Height cm	5~30			10			10~20	5~15	1~10	18	
No. of Species	4	4	8	8	9	8	3	6	6	6	
Coverage %	40	50	30	20	20	50	60	40	30	38	
Anaphalis contorta				+							I
A. triplinervis				+	+	2	+	+	+	0.2	III
Cerastium						+					I
Docecadenia grandiflora					+						I
Elatostema		+	+								I
Euonymus			+						1	0.1	I
Fragaria nubicola				+	+	+					II
Gaultheria nummuralioides								3		0.3	I
Gentiana capitellata				+		+					I
Hyperium uralum				+							I
Hemiphragma heterophyllum				+							I
Myriactis nepalensis			+								I
Pilea	+										I
Pimpinella diversifolia						+	+	+	+		II
Ranunculus diffusus			+								I
Rubus fockeana	4	4	3							1.2	II
Rubus					+			+	+		II
Sanicula elata			+		+			+			II
Viburnum erubescens			+								I
Viola	+				+						I
Valeriana hardiwickii					+	1			+	0.1	II
Arundinaria					+						I
Campylandra aurantiaca				+		2				0.2	I
Carex		1		2	1	3	6	1	+	1.6	IV
Ophiopogon	+		+								I
Polystichum		1								0.1	I

Table 50. Floristic Composition of *Rhododendron arboreum* var. *campbelliae* Forest (Plot No. 114)

Canopy Plot & Quadrat No. (10m x 10m)	114–214
1st Layer	
Height m	5~10
No. of Species	2
Coverage %	95
Rhododendron arboreum var. *campbelliae*	8
Juniperus wallichii	5
Shrub Layer	
Height m	1~1.5
No. of Species	3
Coverage	+
Berberis	+
Lonicera	+
Rhododendron arboreum var. *campbelliae*	+

Herb Layer Quadrat No. (1m x 1m)	114–214– 1	2	3	M	C
Height cm	5~10			5~10	
No. of Species	10	10	8	9	
Coverage %	100	70	60	77	
Ainsliaea pteropoda	+				II
Berberis	+				II
Fragaria	+	+	+		V
Myriactis nepalensis			+		II
Oxygraphis glacialis			+		II
Phlomis?		+			II
Primula petiolata	+				II
Umbelliferae *0997*		+			II
Ranunculus			+		II
Valeriana wallichii	+	+	+		V
Carex			+		II
Poa	+		3	1.0	II
Juniperus		+			II
Actinothuidium hookeri		4		1.3	II
Bartramia		+			II
Campylopus	2	1		1.0	III
Lepidozia tridens	2	3	3	2.7	V
Plagiochila grollei	2			0.7	II
Symblepharis	7	1		2.7	III

Table 51. Floristic Composition of *Rhododendron arboreum* var. *campbelliae* Forest (Plot No. 116)

Canopy Plot & Quadrat No. (10m x 10m)	116–216
1st Layer	
Height m	8
No. of Species	2
Coverage %	95
Rhododendron arboreum var. *campbelliae*	10
R. barbatum	+
Shrub Layer	
Height m	1~1.5
No. of Species	2
Coverage %	10
Daphne bholua	1
Viburnum erubescens	+

Herb Layer Quadrat No. (1m x 1m)	116–216– 1	2	3	M	C
Height cm	0~5	0~10		8	
No. of Species	7	6	4	6	
Coverage %	80	50	10	47	
Daphne bholua		+			II
Elatostema obtusa		+			II
Peracarpa carnosa			+		II
Primula denticulata	+				II
Ranunculus	+		+		III
Rubus fockeana		1		0.3	II
Sanicula elata	+				II
Carex	1		+	0.3	III
Actinothuidium hookeri	6	+		2.0	III
Plagiochila grollei	1	1	+	0.7	V
Thidium cymbifolium	3	2		1.7	III

Table 52. Floristic Composition of *Rhododendron campanulatum* Forest (Plot No. 29).

Canopy Plot & Quadrat No. (10m x 10m)	29–64
Height m	4
No. of Species	6
Coverage %	100
Prunus rufa	+
Rhododendron campanulatum	10
Rosa sericea	+
Sorbus foliolosa	+
Arundinaria hookeri	+
Juniperus squarrosa	1

Herb Layer Quadrat No. (1m x 1m)	29–64– 1	2	3	M	C
Height cm	15	10	5	10	
No. of Species	13	14	9	12	
Coverage %	10	30	+	13	
Bistorta vivipara	+	+	+		V
Cyananthus 2337		+	+		III
Impatiens	1	+	+	0.3	V
Koenigia nepalensis	+				II
Pilea approximata	+	1	+	0.3	V
Pratia montana		+			II
Rhododendron anthopogon	+				II
Rh. campanulatum		+			II
Rh. lepidotum	+		+		III
Rubus fockeana		1		0.3	II
Sorbus foliolosa		+			II
Veronica umbelliformis	+				II
Viola biflora	+				II
Luzura spicata		+			II
Smilacina purpurea		+			II
Gramineae *2335*	+				II
Polystichum	+				II
Fern *2336*		+	+		II
Actinothuidium hookeri	1	+	+	0.3	V
Symblepharis reinwardtii	+	+	+		V
Plagiochila	+	2	+	0.7	V

Table 53. Floristic Composition of *Rhododendron campanulatum* Forest (Plot No. 53).

Canopy Plot & Quadrat No. (10m x 10m)	53–114
Height m	5~3
No. of Species	5
Coverage %	95
Abies spectabilis	+
Berberis aristata	+
Lyonia ovalifolia	+
Rhododendron barbatum	1
Rh. campanulatum	9

Herb Layer Quadrat No. (1m x 1m)	53–114– 1	2	3	M	C
Height cm	20			20	
No. of Species	11	10	8	10	
Coverage %	90	90	50	77	
Ainsliaea pteropoda	2	1	+	1.0	V
Bistorta affine			+		II
Elatostema obtusa	+	+			III
Pilea subalpina	+	+	+		V
Strobilanthes atropurpureus	2	2	1	1.7	V
Triplostegia glandulifera		+			II
Viburnum erubescens	+				II
Carex cruciata	7	6	3	5.3	V
Dryopteris sinofibrillosa	+	+	+		V
Fern *A2936*	+				II
Polypodium			+		II
Actinothuidium	1	3	2	2.0	V
Thuidium	+	+			III
Moss	+				II
Moss		+			II

Table 54. Floristic Composition of *Rhododendron campanulatum* Forest (Plot No. 58).

Canopy Plot & Quadrat No. (10m x 10m)	58–129
Height m	1.5
No. of Species	1
Coverage %	100
Rhododendron campanulatum	10

Herb Layer Quadrat No. (1m x 1m)	58–129– 1	2	3	M	C
Height cm	40	20	30	30	
No. of Species	15	17	22	18	
Coverage %	50	80	90	73	
Polygonum molle	3	1	+	1.3	V
Acronema tenerum	1	+		0.3	III
Anaphalis adnata	+		+		III
Anaphalis triplinervis	+	+	+		V
Berberis			+		II
Bistorta affine	+	+			III
Cremanthodium	+		+		III
Euphorbia himalayensis		+	+		III
Fragaris nubicola	+				II
Geranium polyanthes	+	+	+		V
Lonicera obovata		+			II
Oxygraphis polypetala	2	1	2	1.7	V
Pilea subalpina	+		+		III
Potentilla	+	+	+		V
Primula denticulata		+			II
Salix			+		II
Sorbus foliolosa			+		II
Taraxacum		+	+		III
Triplostegia glandulifera		1		0.3	II
Gaultheria trichophylla		+			II
Aletris pauciflora			+		II
Carex	+		+		III
Gramineae	+		2	0.7	III
Polygonatum punctatum			+		I
Actinothuidium	1	1	1	1.0	V
Cladonia		+	+		III
Plagiochila	2	4	5	3.7	V
Thuidium			+		II
Moss		2	1	1.0	III

Table 56. Floristic Composition of *Betula* Forest (Plot No. 59).

Canopy Plot & Quadrat No. (10m x 10m)	59–130
1st Layer	
Height m	9
No. of Species	3
Coverage %	80
Betula utilis	8
Lonicera parvifolia	+
Rhododendron campanulatum	1
Shrub Layer	
Height m	2~1
No. of Species	3
Coverage %	60
Arundinaria maling	5
Rhododendron cowanianum	1
Ribes glaciale	+

Herb Layer Quadrat No. (1m x 1m)	59–130– 1	2	3	M	C
Height cm	10	40	20	23	
No. of Species	15	12	6	11	
Coverage %	80	90	70	80	
Bistorta affine	1	2	3	2.0	V
Cremanthodium		1		0.3	II
Fragaria nubicola		+			II
Geranium polyanthes	+	+			III
Impatiens falcifer	+	1	1	0.7	V
Parnassia	+				II
Primula		+			II
Nardostachys jatamansi	1			0.3	II
Ainsliaea pteropoda	+	3	2	1.7	V
Triplostegia glandurifera	1			0.3	II
Viola biflora	+				II
Carex	+	+			III
Juncus	+				II
Gramineae	+	1		0.3	III
Fern		+			II
Actinothuidium	1	3	2	1.7	V
Cladonia	+				II
Plagiochila	3		3	2.0	III
Thuidium	2	2	1	1.7	V

Table 55. Floristic Composition of *Betula* Forest (Plot No. 35, 36 & 37).

Canopy Plot & Quadrat No. (10m x 10m)	35– 91	92	36– 93	37– 94	M	C
1st Layer						
Height m	10	10	15	13	12	
No. of Species	1	1	1	1	1	
Coverage %	95	80	95	85	89	
Betula utilis	10	8	10	9	9.3	V
Shrub Layer						
Height m	4~3	5	3~1	3~1		
No. of Species	3	3	5	6	4	
Coverage %	5	+	50	50	26	
Berberis 2535			+			I
Betula utilis	+					I
Lonicera obovata				+		I
Lonicera purpurascens	+	+	2	3	1.3	V
Prunus rufa			+			I
Rhododendron campanulatum		+	3	1	1.0	IV
Ribes glaciale				+		I
Rosa sericea				+		I
Sorbus foliolosa	+	+	+	+		V

Herb Layer Quadrat No. (1m x 1m)	35–91– 1	2	3	35–92– 1	2	3	36–93– 1	2	3	37–94– 1	2	3	M	C
Height cm	50	50	50	50	30	50	50	40	30	40	40	30	43	
No. of Species	9	8	9	9	7	5	3	7	7	10	8	12	8	
Coverage %	70	90	90	80	70	80	90	80	90	70	70	70	79	
Aconitum bisma												+		
Betula utilis										+				
Bistorta vivipara								+	+					I
Cacalia quinqueloba	5	8	6	5	4	7	1	1	1	4	1	5	4.0	V
Circaea alpina									+					
Galium asperuloides												+		
Lonicera obovata					+									
Lonicera purpurascens			+											
Morina betonicoides												+		
Pilea symmerica			1				1	1			+	+	0.3	II
Prunus rufa												+		
Rheum emodi					+									
Ribes glaciale								+						
Sorbus foliolosa		+	+											I
Sorbus microphylla										+				
Umbelliferae *2530*	+	+	+	+	+					+		+		III
Allium wallichii	+	+				+				+		+		II
Carex alpina?	+	2		+							1		0.3	II
Smilacina fusca	+	+	+	+		+			+	+	+	+		IV
Gramineae *2530*	1	+	5	+					1	2	1	+	0.8	III
Athyrium (1) 2529	1	1	2	4	5	2							1.3	III
Athyrium (2) 2537							8	7	7		5		2.3	II
Athyrium (3) 2538										1			0.1	
Fern*2527*	2			+	1					2			0.4	II
Pholia				+					1				0.1	I
Thuidium	1		2	+	2	3		+		1	+	3	1.0	IV

Table 57. Basal Areas and Floristic Composition. (Arranged by altitudinal order of plots.)

	Girth (cm)	ΣG^2	%
Plot No. 74, 20m x 20m x 1, alt. 100m			
Carreya arborea	14	196	0.1
Shorea robusta	65, 72, 150, 105, 67, 41, 67, 171, 112, 170	124278	63.1
Adina cordifolia	140, 130, 160	62100	31.5
Leguminosae	72	5184	2.6
Lagerstroemia parviflora	19	361	0.2
Ougeinia dalbergioides	21, (15, 14, 12)	1006	0.5
4952	14	196	0.1
Ziziphus rugosa	25	625	0.3
4954	52	2704	1.4
Dillenia pentagyna	19	361	0.2
	Total & Basal Area %	197011	0.3921
Plot No. 75, 20m x 20m x 1, alt. 100m			
Holarrhena antidysenterica	46	2116	1.0
Terminalia chebura	67	4489	2.2
Shorea robusta	163, 71, 62, 61, 122, 70, 146, 160, 58, 45, 39	112785	55.4
Terminalia tomentosa	151	22801	11.2
Dillenia pentagyna	27, 163	27298	13.4
4955	116	13456	6.6
4950	20	400	0.2
Terminalia berelica	45	2025	1.0
4961	36	1296	0.6
4954	(91, 43)	10130	5.0
Lagerstroemia parviflora	83	6889	3.4
	Total & Basal Area %	203685	0.4054
Plot No. 76, 20m x 20m x 1, alt. 100			
Terminalia tomentosa	218	47524	40.0
Lagerstroemia parviflora	50, 30	3400	2.9
Carreya arborea	151, 11	22922	19.2
Brideria retusa	100	10000	8.4
Holoptelea integrifolia	35, 101	11426	9.6
Bauhinia variegata	60, 55	6625	5.6
Mallotus philippinensis	33	1089	0.9
4963	90	8100	6.8
Ziziphus rugosa	22, 33	1573	1.3
Holarrhena antidysenterica	26	676	0.6
4964	50, 26	3176	2.7
Terminalia chebura	51	2601	2.2
	Total & Basal Area %	119112	0.2371
Plot No. 80, 20m x 20m x 1, alt. 170m			
Shorea robusta	27, 47, 110, 72, 34, 58, 133, 34, 35, 46, 30, 31, 67, 30, 35, 60, 60, 21, 49, 24, 131, 13	99551	54.3
Adina cordifolia	130, 97, 85	33534	18.3
Eugenia operculata	135	18225	9.9
Elaeocarpus serrata?	94	8836	4.8
Lagerstroemia parviflora	145	21025	11.5
Caesalpinia sepiaria	48	2304	1.3
	Total & Basal Area %	183475	0.3652

	Girth (cm)	ΣG^2	%
Plot No. 81, 20m x 20m x 1, alt. 180m			
Lagerstroemia parviflora	90	8100	3.1
Holarrhena antidysenterica	21	441	0.2
Shorea robusta	136, 36, 51, 71, 67, 115, 68, 50, 163, 40, (171, 67), 172, 122, 77, 40, 65, 60, 70, 72, 162, 65, 45, 163, 46, 33, 75	251970	96.7
	Total & Basal Area %	260511	0.5185
Plot No. 79, 10m x 10m x 1, alt. 210m			
Acacia eburnea	96, 78, 65	19525	75.1
Trachelospermum lucidum	19, 11, 12, (12, 17), (16, 17)	1604	6.2
Clerodendrum	52	2704	10.4
Colebrookia oppositifolia	22, 17	773	3.0
Caesalpinia	(22, 10)	584	2.2
Erythrina	14	196	0.8
Adina cordifolia	25	625	2.4
	Total & Basal Area %	26011	0.2071
Plot No. 71, 10m x 10m x 2, alt. 400m			
Shorea robusta	84, 142, 124, 81, 84, 110, 131	85474	51.6
Semecarpus anacardium	46	2116	1.3
Lagerstroemia parviflora	71	5041	3.0
Holoptelea integrifolia	31	961	0.6
Buchanania latifolia	37, 30, 26, 50, 30, 10	6445	3.9
Terminalia chebura	46, 71	7157	4.3
4928	16, 26	932	0.6
Terminalia tomentosa	239	57121	34.5
Wendlandia exserta	11	121	0.1
Ougeinia dalbergioides	16	256	0.2
	Total & Basal Area %	165624	0.6593
Plot No. 72, 10m x 10m x 1, alt. 400			
Shorea robusta	52, 19, 123	17674	65.9
Kydia lobata	43	1849	6.9
Wendlandia exserta	58	3364	12.5
4941	26	676	2.5
Casearia glomerata	(30, 16), 18	1480	5.5
Eugenia jambolana	40	1600	6.0
Machilus	14	196	0.7
	Total & Basal Area %	26839	0.2137
Plot No. 73, 10m x 10m x 1, alt. 420m			
Shorea robusta	78, 60, 110	21784	35.8
Semecarpus anacardium	35, 11	1346	2.2
Bauhinia variegata	62, 30, 46	6860	11.3
Buchanania latifolia	35, 81	7786	12.8
Terminalia tomentosa	91	8281	13.6
Lagerstroemia parviflora	77, 72	11113	18.3
Nyctanthus arbor-tristis	(11, 40, 40), 20	3721	6.1
	Total & Basal Area %	60891	0.4848

	Girth (cm)	ΣG^2	%
Plot 78, 10m × 10m × 2, alt. 820m			
Shorea robusta	124, 141, 77, 49, 29, 52, 50	57192	78.0
Terminalia tomentosa	30, 25, 25, 41, 27, 45	6585	9.0
Glochidion velutina	40, 30, 25, 10	3225	4.4
Lagerstroemia parviflora	16	256	0.3
Semecarpus anacardium	19	361	0.5
4990	50, 36	3796	5.2
Grewia vestita	23	529	0.7
Embrica officinalis	36	1296	1.8
Ehretia	11	121	0.2
	Total & Basal Area %	73361	0.2920
Plot No. 77, 10m × 10m × 2, alt. 1050m			
Schima wallichii	126, 167	43765	62.4
Castanopsis tribuloides	(49, 26), 11, (56, 114), 15	19555	27.9
Machilus odoratissima	80	6400	9.2
Eugenia operculata	20	400	0.6
	Total & Basal Area %	70120	0.2791
Plot No. 10, 10m × 10m × 1, alt. 1480m			
Pinus roxburghii	88, 84, 117	28489	100.0
	Total & Basal Area %	28489	0.2268
Plot No. 9, 10m × 10m × 2, alt. 1520m			
Myrica esculenta	64	4096	1.8
Pinus roxburghii	185, (110, 122), 200, 157, 179, 141	177780	80.0
Schima wallichii	52, 42, 69, 42, 43, 69, 32, 73, 77, 87, 55	40479	18.2
	Total & Basal Area %	222355	0.8852
Plot No. 48, 10m × 10m × 1, alt. 1730m			
Pinus griffithii	160, 125, 85, 100	58450	100.0
	Total & Basal Area %	58450	0.4654
Plot No. 67, 10m × 10m × 2, alt. 1750m			
Carpinus viminea	64, 75, 20, 65, 55, 60, 106, 79	38448	52.1
Ilex corymbosa	40, 28	2384	3.22
Machilus duthiei	45, 14	2221	3.0
Lindera pulcherrima	18, (34, 38), 18, 28, 28	4816	6.5
Symplocos theaefolia	35, 35, (16, 21)	3147	4.3
Euonymus tingens	21, 35, 15	1891	2.6
Turpinia cochinchinensis	(38, 54, 27)	5089	6.9
Litsea oblonga	56	3136	4.2
Acer oblongum	26	676	0.9
Quercus lineata	(56, 93)	11785	16.0
Eurya acuminata	15	225	0.3
	Total & Basal Area %	73818	0.2939

	Girth (cm)	ΣG^2	%
Plot No. 68, 10m x 10m x 1, alt. 1750m			
Quercus glauca	14	196	0.6
Quercus lineata	46, 50, 51, (37, 40), 28, (38, 45, 23)	15731	45.3
Castanopsis tribuloides	40, 46	3716	10.7
Carpinus viminea	17	289	0.8
Schima wallichii	(70, 14)	5096	14.7
Fraxinus floribunda	50	2500	7.2
Turpinia cochinchinensis	18, 16, 21	1021	2.9
Eurya acuminata	56	3136	9.0
Myrica esculenta	55	3025	8.7
	Total & Basal Area %	34710	0.2764
Plot No. 49, 10m x 10m x 2, alt. 1760m			
Meytenus rufa	7, 10	149	0.1
Xylosma controversa	20, 20, 20, 18, 18, 18	1848	1.8
Albizia julibrissin	35, 60, 70, 40	11325	11.0
Acer oblongum	30, 9, 10, 32, 9, 11, 24, 14, 23, 12	3752	3.6
Carpinus viminea	28, 33, 32, 30, 22, 30, 25, 11, 58, 28, 21, 62, 30, 23, 29, 31, (31, 18), 12	19020	18.5
Celtis tetrandra	35, 50, 63, 10	7794	7.6
Climber (not identified)	15, 7, 9	355	0.3
Quercus glauca	9, 17, 15, 9, 13, 15, 36, 9, 13, 9, 13, 9, 20, 14, 45, 15, 13, 14, 29, 35, 16, 19, 12, 9, 9	6200	6.0
Pyrus pashia	13	169	0.2
Jasminum multiflorum	9	81	0.1
Symplocos pyrifolia	23, (24, 45, 35, 37), (14, 20, 23)	6849	6.7
Ligustrum nepalense	24, 10, 18	1000	1.0
Ziziphus incurva	29, 52, 61, 25	7891	7.7
Schima wallichii	65, 48	6529	6.3
Machilus duthiei	160	25600	24.9
Myrica esculenta	(31, 11), 20	1482	1.4
	Total & Basal Area %	102991	0.4100
Plot No. 4, 10m x 10m x 6, alt. 1790m			
Acer oblongum	111	12321	5.8
Cornus oblonga	113	12769	6.1
Ligustrum nepalense	102, 72, 77, 50, 57	27266	12.9
Lyonia ovalifolia	45	2025	1.0
Machilus duthiei	90	8100	3.8
Myrica esculenta	103	10609	5.0
Myrsine semiserrata	40, (67, 25, 34), 27, 47, 36, 27	12833	6.1
Phoebe lanceolata	61, 120, 67, 22, 35	24319	11.5
Pyrus pashia	55, 53, 76, 59	15091	7.2
Quercus spicata	129, 110	28741	13.6
Schima wallichii	215, 103	56834	26.9
	Total & Basal Area %	210908	0.2799

	Girth (cm)	ΣG^2	%
Plot No. 66, 10m x 10m x 2, alt. 1970m			
Lyonia ovalifolia	60, (80, 48, 77, 47, 37, 72), 23, (48, 14), (40, 20, 26), 68, 58	40688	39.0
Ficus nemoralis	11	121	0.1
Quercus lanuginosa	77, 69, 75, (84, 112, 75)	41540	39.8
Quercus lineata	13, 10	269	0.3
Castanopsis tribuloides	32, 39	2545	2.4
Rhododendron arboreum	60, 42, 65	9589	9.2
Quercus glauca	77	5929	5.7
Machilus duthiei	37	1369	1.3
Schima wallichii	34, 27	1885	1.8
	Total & Basal Area %	104335	0.41534
Plot No. 8, 10m x 10m x 5, alt. 2000m			
Acer oblongum	106, 161	37157	12.6
Albizia mollis	228	51984	17.6
Castanopsis tribuloides	118	13924	4.7
Machilus duthiei	170, 125	44525	15.1
Michelia kisopa	183, 157, 131	75299	25.5
Phoebe lanceolata	100, 96, 155, 170	72141	24.5
	Total & Basal Area %	295030	0.4698
Plot No. 65, 10m x 10m x 1, alt. 2020m			
Ligustrum nepalense	17	289	0.1
Quercus lineata	317, 237, (90, 30), 170	194558	96.0
Lindera pulcherrima	20, 18, 39, 18, (28, 15), (31, 26, 22, 17, 21)	6429	3.2
Viburnum coriaceum	12	144	0.1
Myrsine semiserrata	15	225	0.1
Machilus duthiei	27	729	0.4
Eurya acuminata	17	289	0.1
	Total & Basal Area %	202663	1.6136
Plot No. 64, 10m x 10m x 6, alt. 2030m			
Quercus glauca	(140, 80, 140), (122, 35, 146), 14, 12, 12, (90, 40), 132, 112, 65	127402	24.8
Quercus lineata	(195, 35, 98, 21, 105), 25, 25, 100, (130, 145), 96, 260, (183, 138, 55, 15), 145	263119	51.3
Eurya acuminata	27, 12, 18, 22, 15, 89, 96, (60, 32), 31	24628	4.8
Rhododendron arboreum	130, 126, 28, 15, 15	29062	5.7
Lindera pulcherrima	42, 27, 32, 20, 15, 27	4871	0.9
Meliosma dilleniifolia	(18, 15), (35, 29), 15, 22, 83	10213	2.0
Symplocos ramosissima	12, (16, 31), 19	1722	0.3
Carpinus viminea	36, 22, 197	40589	7.9
Skimmia	22	484	0.1
Prunus cerasoides	20	400	0.1
Euonymus tingens	38, 35, 71	7710	1.5
Myrsine semiserrata	25	625	0.1
Brassaiopsis	13	169	0.0
Machilus duthiei	19	361	0.1
	Total & Basal Area %	513155	0.6809

	Girth (cm)	ΣG^2	%
Plot No. 70, 10m x 10m x 2, alt. 2030m			
Rhododendron arboreum	(50, 44), 69, 60, 47, 101, 76, 44, 70, 84, 70, 80	56175	50.4
Quercus lanuginosa	70, 60, 61, 61, 70, 85, 84, 121	49764	44.7
Wendlandia puberula	14	196	0.2
Lyonia ovalifolia	70	4900	4.4
Myrica esculenta	20	400	0.4
	Total & Basal Area %	111435	0.4436
Plot No. 5, 10m x 10m x 4, alt. 2050m			
Lyonia ovalifolia	47, 72	7393	5.3
Myrica esculenta	49	2401	1.7
Quercus lanuginosa	75, 85, 68, 53, 64, 70, 74, 112, 55, 83, 110, 90, 63, 87, 67, 67, 96, 64, 97, 75, 67	130986	93.0
	Total & Basal Area %	140780	0.2802
Plot No. 7, 10m x 10m x 1, alt. 2050m			
Quercus lanuginosa	69, 65, 62	12830	100.0
	Total & Basal Area %	12830	0.1021
Plot No. 51, 10m x 10m x 1, alt. 2170m			
Quercus lanuginosa	90, 100, 150, 46, 90	50816	63.4
Lyonia ovalifolia	(71, 38), 68	11109	13.9
Rhododendron arboreum	(59, 55), 108	18170	22.7
	Total & Basal Area %	80095	0.6377
Plot No. 50, 10m x 10m x 1, alt. 2190m			
Quercus semecarpifolia	(110, 130), 80	35400	98.8
Viburnum stellatum	21	441	1.2
	Total & Basal Area %	35841	0.2854
Plot No. 52, 10m x 10m x 1, alt. 2190m			
Quercus lineata	180, (90, 185)	74725	94.5
Rhododendron arboreum	45, 48	4329	5.5
	Total & Basal Area %	79054	0.6294
Plot No. 69, 10m x 10m x 1, alt. 2270m			
Lyonia ovalifolia	49	2401	2.4
Myrsine semiserrata	23, 15	754	0.7
Rhododendron arboreum	150, 220, 134	88856	87.6
Quercus lineata	21	441	0.4
Q. semecarpifolia	29, 20, 32, 30, 45, 36, 50	8986	8.9
	Total & Basal Area %	101438	0.8076

	Girth (cm)	ΣG^2	%
Plot No. 33, 10m x 10m x 6, alt. 2720m			
Quercus semecarpifolia	98, 75, 50, 72, 41, 65, 99, 80, 37, 58, 86, 260, 180, 284, 147, 74, 45, 73, 45, 138, 85, 69, 122, 65, 73, 54, (95, 60), 72, 79, 91, 134, 130, 70, 37, 69, 210, 147, 86, 60	485575	92.0
Ilex dipyrena	48, 34, 53, 56, (34, 26), 29, 27, (23, 33, 27), 50, 60, 47, (37, 29), (22, 33, 17), 52	30939	5.9
Viburnum erubescens	35	1225	0.2
Rhododendron arboreum var. *campbelliae*	(55, 49)	5426	1.0
Pieris formosa	(42, 31), 23	3254	0.6
Berberis aristata	(27, 20, 21, 20)	1970	0.4
	Total & Basal Area %	527689	0.7002
Plot No. 32, 10m x 10m x 6, alt. 2840m			
Osmanthus fragrans	38, 39, 39	4486	0.5
Tsuga dumosa	435, 416, 330	471181	50.9
Abies spectabilis	215, 192, 360, 162, 350	361433	39.0
Ilex dipyrena	(32,51), (46, 37), 74, 58, 34, 57, 62, 170, 81, 141, 44, 71	86518	9.3
Rhododendron arboreum var. *campbelliae*	47	2209	0.2
	Total & Basal Area %	925827	1.2285
Plot No. 44, 10m x 10m x 6, alt. 3000m			
Quercus semecarpifolia	87, 87, 153, 170, (121, 85), 105, 137, 130, 96, (120, 56), (127, 95), 79, 91, 76, 74, (130, 96, 76), 108, 105, (123, 58), 71, 199, (65, 114), 239, 100, 124, 287, 60, 55, (56, 81, 81), 70, (64, 44)	546305	92.5
Rhododendron arboreum var. *campbelliae*	(41, 57), 35, 50, (41, 41, 49, 42), 57, 72, (30, 74, 41), 21, (44, 11)	35170	6.0
Sorbus hedlundi	(65, 71)	9266	1.6
	Total & Basal Area %	590741	0.7839
Plot No. 53, 10m x 10m x 1, alt. 3060m			
Lyonia ovalifolia	(130, 90, 50)	27500	29.7
Rhododendron barbatum	(30, 30), (20, 50, 30, 15), (30, 20, 15, 20), 15, 45, (50, 50), (52, 25), (35, 30), 35, 30, 5, 5, 32	23653	25.6
Rhododendron campanulatum	(60, 35), 30, 50, (50, 13), 35, 16, (30, 20, 20, 16, 15), (25, 25), (19, 15, 14), (16, 20, 35, 41), 19, 35, 19, 18, 78, (15, 15), 15, 60, 5, 65, 50, 40	41112	44.5
Abies spectabilis	15	225	0.2
	Total & Basal Area %	92490	0.7365

	Girth (cm)	ΣG^2	%
Plot No. 34, 10m x 10m x 6, alt. 2330m			
Lindera bifaria	(194, 114), (115, 116, 90, 110), (106, 147), 108, 120, 92, (100, 142, 177), 140, (60, 111, 109, 202)	314974	55.3
Acer campbellii	(113, 126), 365	161873	28.4
Machilus duthiei	(58, 92), 19, 139	31510	5.5
Juglans regia	168, 165	55449	9.7
Meliosma dilleniifolia	56, 51	5737	1.0
	Total & Basal Area %	569543	0.7558
Plot No. 63, 10m x 10m x 6, alt. 2430m			
Quercus lamellosa	(80, 70), 142, 130, (172, 85), 18, 70, 93, 139, 65	122592	36.4
Quercus lineata	163, 24, 75, 18, 64, 63	41159	12.2
Eurya acuminata	39, 78	7605	2.3
Meliosma dilleniifolia	54, 49, 61, 51	11639	3.5
Lindera pulcherrima	15, 55, 57	6499	1.9
Euonymus tingens	75, 104	16411	4.9
Euonymus acuminatus	(62, 50)	6344	1.9
Machilus duthiei	38, 68, 54, (105, 66, 120), 85, 26, 80	53066	15.8
Rhododendron arboreum	130, 26, 40	19176	5.7
Ilex dipyrena	27, 42	2493	0.7
Machilus sericea	30, 25, 36, 100	12821	3.8
Berberis chitria	(27, 15)	954	0.3
Daphne bholua	19	361	0.1
Quercus semecarpifolia	187	34969	10.4
Trichilia connaroides	28	784	0.2
	Total & Basal Area %	336903	0.4471
Plot No. 62, 10m x 10m x 6, alt. 2480m			
Quercus semecarpifolia	365, 348, 449	455930	90.1
Rhododendron arboreum	101, 62, 41, 139	35047	6.9
Symplocos theaefolia	19, 30, 50, 71, 55	11827	2.3
Lindera pulcherrima	15	225	0.0
Dodecadenia grandiflora	37	1369	0.3
Berberis chitria	22	484	0.1
Viburnum erubescens	22	484	0.1
Meliosma dilleniifolia	24	576	0.1
	Total & Basal Area %	505942	0.6714
Plot No. 61, 10m x 10m x 6, alt. 2540m			
Quercus semecarpifolia	265, 340, 17, 27, 80, 66, 285, 140, 78, (125, 130), 150, 354	484849	94.7
Euonymus tingens	92, 115, 75	27314	5.3
	Total & Basal Area %	512163	0.6796

	Girth (cm)	ΣG^2	%
Plot No. 54, 10m x 10m x 6, alt. 3120m			
Rhododendron arboreum var. *campbelliae*	90, 55, 40, (48, 50, 28), 56, (75, 72), 50	34758	4.8
Rhododendron barbatum	(63, 55, 30), 51, 30, 14, 65, 30, (55, 50, 50), (54, 54, 53, 30), 46, 41, 45, 54, 31, 41, 62, 25, 54, (55, 26, 23, 57), (58, 96), (21, 30), (15, 18), 47, (40, 39, 35), (45, 25), (65, 64, 33, 48), 35, 25, (87, 60, 57), 52, 44, (15, 10), 48, (18, 20), 70, (46, 47)	129401	17.7
Abies spectabilis	292, 284, 380, 375, 495	565970	77.3
Viburnum erubescens	(30, 20, 10), 9, 11	1602	0.2
	Total & Basal Area %	731731	0.9710
Plot No. 60, 10m x 10m x 3, alt. 3170m			
Rhododendron arboreum var. *campbelliae*	(79, 65), 118, 89, (131, 62, 147), 70, (101, 121, 105, 118), (139, 90, 72), 60, 30, 120, (87, 48), 90, 70, (240, 154, 145)	306335	69.1
Abies spectabilis	370	136900	30.9
	Total & Basal Area %	443235	1.1763
Plot No. 55, 10m x 10m x 1, alt. 3180m			
Juniperus recurva	111, 111, 77, 208, (48, 35), 65	81589	100.0
	Total & Basal Area %	81589	0.6496
Plot No. 31, 10m x 10m x 1, alt. 3200m			
Rhododendron arboreum var. *campbelliae*	(79, 40, 51, 34), (38, 40, 48), 37, 28, (60, 46), 66, 129, 14, 45	48033	92.4
Kalopanax	63	3969	7.6
	Total & Basal Area %	52002	0.4140
Plot No. 30, 10m x 10m x 1, alt. 3210m			
Rhododendron arboreum var. *campbelliae*	(70, 65, 66), 35, (27, 38, 43), (58, 52, 86, 39, 37), 27, 22, (31, 41, 41, 24, 21, 20, 6), 42, 48, 41, 50, 44, 37, 75), 29, 25, 42, (29, 48), (42, 51)	70038	98.2
Cotoneaster acuminatus	(7, 6, 9)	166	0.2
Lonicera acuminata	33	1089	1.5
	Total & Basal Area %	71293	0.5676
Plot No. 56, 10m x 10m x 3, alt. 3250m			
Abies spectabilis	400, 262	228644	58.1
Juniperus recurva	65, 235, 86	66846	17.0
Rhododendron arboreum	(108, 81),	18225	4.6
var. *campbelliae*	(14, 18), 20, 140, 182, (145, 42, 49)	78834	20.0
Viburnum erubescens	15, 21	666	0.2
	Total & Basal Area %	393215	1.0436

	Girth (cm)	ΣG^2	%
Plot No. 59, 10m x 10m x 1, alt. 3410m			
Betula utilis	82, 92, 75, 40, 113	35182	70.7
Lonicera lanceifolia	(28, 16, 30)	1940	3.9
Rhododendron campanulatum	70, 88	12644	25.4
	Total & Basal Area %	49766	0.3962
Plot No. 37, 10m x 10m x 1, alt. 3740m			
Rhododendron campanulatum	24, (13, 14)	941	1.5
Betula utilis	91, 94, 113, 45, (60, 50), 151, 100	60812	93.9
Lonicera purpurascens	(10, 10, 12), (13, 22, 11, 10, 8), (10, 9, 12)	1607	2.5
Sorbus foliolosa	(30, 10), 15, (11, 5)	1371	2.1
	Total & Basal Area %	64731	0.5079
Plot No. 35, 10m x 10m x 2, alt. 3750m			
Betula utilis	56, 146, 56, 16, 57, 65, 54, 93, 63, 88, (78, 43), 98, 67	80622	90.5
Sorbus foliolosa	33, 32, (40, 17), (39, 11), (19, 12), (44, 10), 17	8474	9.5
	Total & Basal Area %	89096	0.3647
Plot No. 36, 10m x 10m x 1, alt. 3750m			
Betula utilis	133, 143, 175, 103	79372	91.8
Rhododendron campanulatum	(17, 11), 17, 12, (12, 11), (31, 31), (28, 33, 34)	6059	7.0
Lonicera purpurascens	12, (13, 14, 14), (11, 8, 8, 7)	1003	1.2
	Total & Basal Area %	86434	0.6882

Table 58. Relative Basal Area in Every 500m Elevation.

Sector (m alt.)	Number of Surveyed Plot	Average Altitude of Surveyed Plots	Average Relative Basal Area (%)
0			
	9	231	0.3564
500			
	2	820	0.2920
1000			
	1	1265	0.2530
1500			
	7	1750	0.4323
2000			
	13	2172	0.6019
2500			
	3	2700	0.8694
3000			
	9	3178	0.7487
3500			
	3	3750	0.5203
4000			

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